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AND

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INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY
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'Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ :—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep; the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.
J. TAYLOR, *Norwich*, 1818.

ALERE FLAMMAM.

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THE
ANNALS AND MAGAZINE
OF
NATURAL HISTORY.

[ELEVENTH SERIES.]

> " .... per litora spargite muscum,
> Naiades, et circùm vitreos considite fontes:
> Pollice virgineo teneros hîc carpite flores:
> Floribus et pictum, divæ, replete canistrum.
> At vos, o Nymphæ Craterides, ite sub undas
> Ite, recurvato variata corallia trunco
> Vellite muscosis e rupibus, et mihi conchas
> Ferte, Deæ pelagi, et pingui conchylia succo."
>
> *N. Parthenii Giannettasii*, Ecl. 1.

No. 43. JULY 1941.

I.—*The Shell Structure of the Ostracoda and its Application to their Palæontological Investigation.* By P. C. Sylvester Bradley, B.Sc., F.G.S.

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Introduction.

A recent examination of certain Upper Jurassic ostracods has shown that they display details of shell structure of which adequate descriptions are not available even in the case of genotypes of some of the commonest genera.

The first zoologists to examine the Ostracoda were mainly concerned with the general shape and ornamentation of the carapace. Often they only examined the dead shells of specimens, so that the palæontologists of the time were at no considerable disadvantage. It was not long, however, before most of them began to pay closer attention to the appendages and body of the animal, and soon they gave the shell but passing attention. The great Norwegian authority on Crustacea, G. O. Sars, gives only the barest outline of shell structures in his general work on the Crustacea of Norway (1922–28), although it was published so recently

G. W. Muller was one of the first workers to investigate in detail all the characters displayed by both the body and shell of the ostracod. His two classical monographs (1894 and 1900) have remained to a large extent the basis of subsequent work Fassbinder, a pupil of Muller, went into further details of shell structure in a paper on some freshwater Ostracoda (1912), and Zalanyi followed this up magnificently with two papers on Tertiary species (1913-15 and 1929). Alexander and other American authors have contributed valuable papers on the shell structure of fossil species of the U.S A (*e. g* Alexander (1933) and Stephenson (1936)) The description of the hinge margin by the American authors is particularly comprehensive and precise. Most present workers on recent ostracods are giving increasing attention to shell structure [*e. g.*, Gauthier (1939) and Klie (1938)].

The carapace of the ostracod is particularly suitable for detailed investigation, since, in spite of the fact that it is periodically shed and replaced during the life of the animal, it is no mere externally secreted shield, as is the shell of a lamellibranch, but is an integral part of the chitinous covering. During life it is covered inside and out with a chitinous envelope. It is perforated all over with pores that give passage to sensory hairs. In its intimate connection with the body of the animal it almost recalls, to a palæontologist, the test of an echinoderm.

The shape, size, and ornamentation of the carapace exhibit great variation, and the details of hinge structure, marginal duplicature, pore canals, and muscle scars provide a very adequate set of diagnostic characters for classification and identification. Much of the work of the early authors needs careful revision on these lines, and most of the established genera still await a full description of shell structure.

For over fifty years the two main genera of ostracods recognized were O. F. Muller's *Cypris* and *Cythere*, and most of the many forms discovered during those years were relegated to these genera. But from 1840 onwards there has been a continual spate of new generic names; the genus *Candona*, introduced by W. Baird in 1845, has remained for a long time a very comprehensive genus of freshwater, creeping forms. It is the intention of this paper to describe in detail the shell structure of the genotypes of these three genera. A comparative revision of the many fossil species, which have up to the present been included within these genera, should lead to a much needed advance in the accuracy of their generic determination.

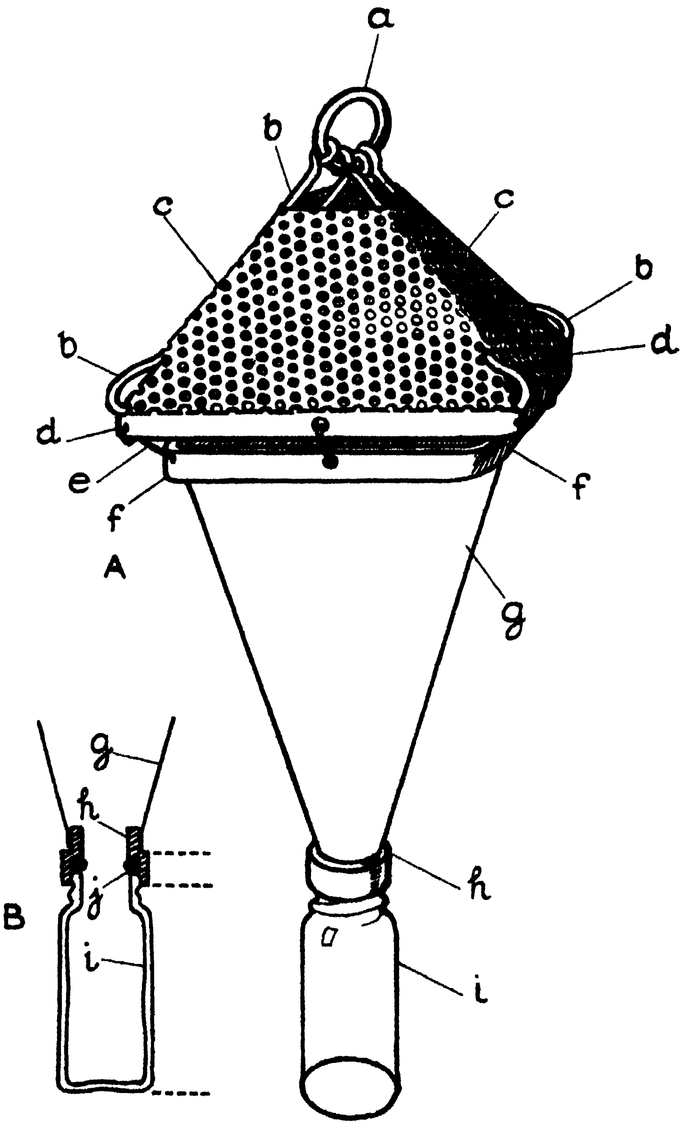
MATERIAL AND TECHNIQUE.

Most recent Ostracoda are collected, together with the rest of the plankton, in tow nets or dredge nets. The freshwater species can be collected by using a small dredge net of the type designed by Birge (see fig. 1); it may either be dragged across the bottom of ponds, puddles or ditches, or towed behind a boat through larger bodies of water. The marine species are usually collected with larger apparatus.

Most of the catch is stored in alcohol, so that the body of the animal is preserved in good condition. For the examination of the shell it is necessary to remove the animal and separate the valves of the carapace. If the body parts are not to be examined, this dissection can be considerably facilitated by boiling in caustic potash. In most museum collections there are, in addition to specimens preserved in spirit, whole carapaces mounted dry; these contain the shrivelled remains of the animal. If they have been stored for some time the valves will automatically separate on boiling in potash, and the remains of the animal will float out.

Fossil ostracods may be preserved in limestone, chert, ironstone, sandstone, marlstone, tufa, peat, marl, clay, shale, or in almost any sedimentary rock. Sometimes they are present in such numbers as to be obvious to the naked eye, but more often they are disseminated but sparsely through the rock. When collecting for stratigraphical work it is advisable to take specimens comprehensively from every level in the same way as for the study of heavy mineral grains. About 2 lb. from each stratum can conveniently be stored in a bag—whether

Fig. 1.



Dredge net. This is an adaptation of the simple pond net. *g* is a cone-shaped net of Swiss bolting silk suspended from a square brass support, *f*, which is wired (*e*) on to a slightly larger square frame *d*. This forms the base of the straining apparatus, which consists of a perforated zinc shield, *c* (⅛-in. holes), supported by four wires (*b*) held at the top by a wire ring (*a*), on to which is fixed either a tow line or wooden handle. The narrow end of the net *g* is fixed to a brass collar *h*. This is adapted to hold a 1-oz. glass bottle (*i*), fitted with a moulded screw-thread. *j* is a rubber washer.

it be hard pieces of rock or handfuls of loose sand, clay or shale. On returning to the laboratory, part of the contents of each bag should be washed by boiling in washing-soda solution (sodium carbonate), the rock first being crushed (not too finely) if that is necessary. The super-natant liquid is repeatedly poured off (after allowing the required fractions to sink to the bottom), and this washing process is continued until no trace of clay or fine material in suspension remains. The resultant concentrations, after they have been washed free from soda, are dried over sand-baths and can be stored for future reference in seed wallets or specimen tubes. When required for examination, they can in turn be passed through a nest of sieves of mesh dimensions varying from 20 to 100 to the inch, and each fraction searched with a lens for Ostracoda.

Many fossil specimens found in Tertiary and post-Tertiary deposits retain the original composition of the shell *. In earlier deposits the shell has usually undergone varying degrees of mineralogical change. Often it remains calcareous in composition, and may retain its translucency even in deposits of Mesozoic age.

Occasionally the original limestone of the rock containing the ostracods may become partly silicified. In this case there will often be patches in which the shells have been replaced by silica while the matrix remains unchanged, and beautifully preserved specimens may be dissolved out with dilute HCl (Harris, 1939, pp. 9–11).

Whenever possible the individual valves should be examined in all positions both by reflected light and by transmitted light. For the former some focusing source of light is needed to allow examination under high powers of the microscope. Often the valves may be too shiny and transparent to show the surface details of ornamentation and general contour clearly, in which case they can be covered with a fine deposit of ammonium chloride, which is white and opaque. For this purpose the specimen is gummed on to a glass slide with a smear of gum tragacanth, and held over the vapour rising from strongly

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* Most of the specimens examined in the analysis of *Cypris pubera* in this paper are from a peaty deposit believed by Mr. A. S. Kennard to be Pleistocene in age. There has been no change in the composition of the shell, and many specimens still exhibit the crushed remains of the animal's appendages adhering to the inside of the shell.

heated ammonium chloride. The required very fine deposit sublimes on to the specimen and the slide.

Some specimens, especially of recent species, are sufficiently transparent to allow examination dry by transmitted light. When this is possible it is usually the most revealing. Otherwise the shells may be cleared in such media as benzyl alcohol, clove oil, glycerin or Canada balsam.

For the accurate determination of the marginal details it is necessary to examine sections across the shell. Various methods have been devised for cutting orientated sections of these little shells. Fassbinder (1912) decalcified the shell, and then cut serial sections in paraffin wax in the usual manner. Gauthier (1939), in addition to this method, successfully sectioned the calcareous portion of the shell by embedding it in collodion. McNair (1938) has prepared thin sections of Bryozoa by half-embedding the specimens in plaster of Paris, and then soaking the plaster in bakelite resin; after allowing the bakelite to polymerize, he ground down the slides as for a thin section of rock. Harris (1939) has cut surface sections of *Chara* stems by first embedding them in bakelite; then orientating them by cutting out a small block containing the specimen in its bakelite, inserting this into a hole bored at the required angle in another block of bakelite, and cementing it there with more bakelite; and finally grinding it down on a fine carborundum stone.

I have adopted two methods in the course of the experimental work reported on in this paper. In the first the specimen was broken with a needle under a dissecting microscope, and the exact positions of the fractures were noted on a measured drawing. The fragments were then mounted upright on a gum tragacanth smear. This method was found suitable for large specimens with thin shells such as *Cypris pubera* O. F. M.

For the other method the shell was immersed in Canada balsam. Only single valves were used as, in the first place, it was not found to be easy to remove all air-bubbles if both valves were present; and, secondly, subsequent examination was complicated by the contents—whether in the form of the remains of appendages of recent specimens, or of a crystalline infilling in the case of fossils. Slides were first prepared by mounting vulcanite cells on glass slides with a heat-resisting cement such as

"Durofix," filling them with raw Canada balsam, and baking them in an oven at about 90° C. until they were thoroughly cooked. These slides were stored until wanted. Meanwhile the shell was carefully measured and drawn in profile under the microscope with a camera lucida. The exact position of the required section was then noted. The measured specimen was soaked in a balsam solvent (such as amyl acetate or xylol) and a slide heated until the balsam had melted. The ostracod was then floated into the cell, and the whole once more reheated until the solvent had had time to disperse. The specimen could then be exactly orientated with a needle under the dissecting microscope, and held in position until the balsam had reset. It was then sectioned by grinding it down with fine carborundum powder on a glass plate. The exact thickness required to be ground away was known from the measured drawing already made, and could be measured by repeatedly focusing down on to the top of the specimen with the high power of a microscope that was fitted with a graduated fine adjustment.

Before applying the cover-slip, the sectioned surface of balsam was cleaned of score-marks and any embedded carborundum grains by squirting on to it a very fine stream of the solvent used. Alternatively, the whole remaining fragment was completely dissolved out of the balsam, dried, and mounted in the required position on a smear of gum tragacanth—as for a broken fragment. After examination and drawing, it could always be re-mounted in balsam, and ground down a further stage. It was not found necessary to make thin sections, as surface sections show all the necessary details, and it is useful to be able to focus down below the level of the cut and observe the course of the various elements behind.

GENERAL MORPHOLOGY AND TERMINOLOGY.

In life the ostracod shell is composed of three layers: an outer chitinous layer, a middle calcareous layer, and an inner chitinous layer. The shell is usually ornamented by tubercles, punctæ, spines, ridges or furrows on the calcareous layer, but in some species the ornament is confined to the outer chitinous *integument* (fig. 13, C). This is especially characteristic of the Candoninæ.

The shell is pierced by pores which are, over the greater part of the shell, at right angles to its surface, and hence are known as *normal pore canals* ("flächenständiger Porenkanal") (fig. 2, NPC). A hair protrudes from each pore canal (fig. 2, H). The two valves are hinged together along the dorsal margin, which is consequently known as the *hinge margin* ("der Schlossrand"). Throughout the rest of their circumference the valves are separated from each other so that the animal has free access to the water. This forms the *contact margin* ("der freien Schalenrand").

The hind margin is in some species simple, when it is merely thickened and traversed by a groove along one or both valves; more often it is fitted with various designs of tooth and socket. The two most common patterns are those characteristic of *Cythere* (described in this paper) and *Cythereis* (described by Alexander (1933, p. 209) and others), but many variations exist.

In life the shell is opened and closed and the mandibulary palps are operated by muscles which are attached to the shell. On death the muscles leave *muscle scars* (=the "lucid spots" of some authors) at their points of attachment. The muscle-scar pattern is a diagnostic feature.

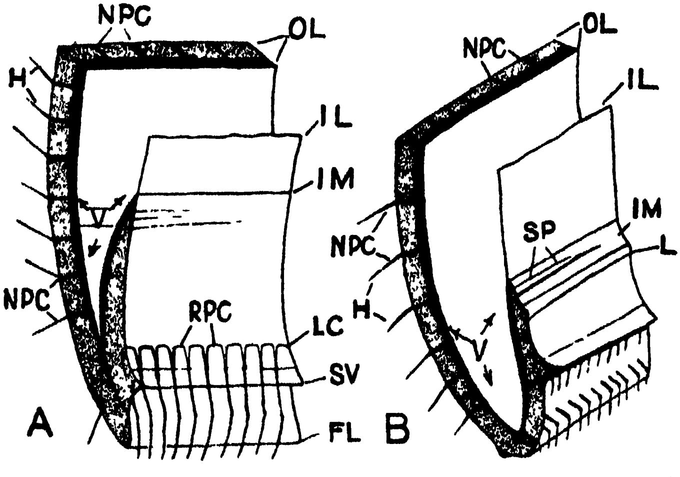
The contact margin turns back on itself and is continued as a chitinous membrane (the *inner lamella*: fig. 2, IL). Morphologically the animal may be said to be entirely enclosed in the space delimited by the inner lamella and the main shell (*i.e.* the *outer lamella*, fig. 2, OL). The peripheral portion of the inner lamella is calcified, and is preserved in the fossil state. This mineralized portion of the inner lamella is termed the *duplicature.* The junction of duplicature with outer lamella may be a simple turn-over, so that the shell thickness is continuous. The free margin is then said to be *monolamellar* (fig. 2, B; fig. 3, F–K). The space enclosed round the periphery between the duplicature and the outer lamella may be termed the *vestibule* ("Schalenhohlraum," fig. 2, V). On the other hand, the duplicature is frequently welded on to the outer lamella at the expense of the vestibule. This is the *bilamellar* type (fig. 2, A; fig. 3, A–E). Either the whole duplicature, or its outer regions only, may be welded on to the outer lamella *.

---

* The familiar apple turn-over affords an example. The region along which it is "turned over" is "monolamellar," the margin is "bilamellar."

The inner limit of the welded region is known as the *line of concrescence* ("Verwachsungslinie," fig. 2, LC). The inner limit of the whole duplicature is termed the *inner margin* ("Innenrand," fig. 2, IM). Often inner margin and line of concrescence coincide so that there is no vestibule at all (fig. 3, E). Pore canals lead from line of concrescence to outer margin, and are known as *radial pore canals* ("randständiger Porenkanal," fig. 2, RPC.), in contrast to the normal pore canals. The radial pore canals may be simple, expanded, funnel-shaped, branched, straight, curved, few, many, crowded or isolated (fig. 3). There should, strictly speaking, be no geometrical line of concrescence in monolamellar shells, but the line along which the radial pore canals open into the vestibule is indistinguishable from a true line of concrescence when viewed by transmitted light (fig. 4, LC), and the term is therefore used for both types of duplicature.

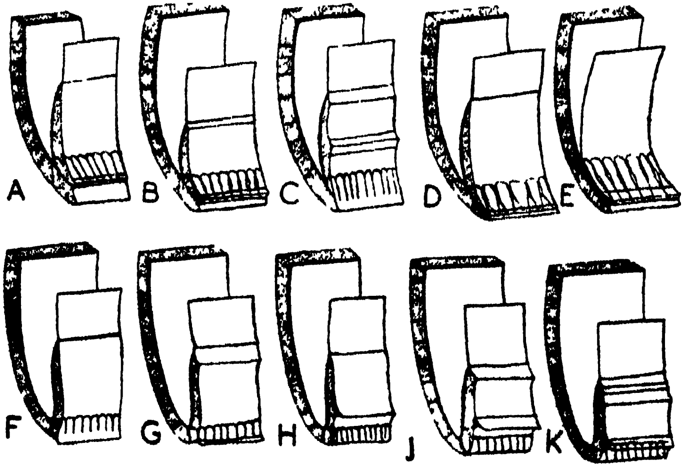
Fig. 2.



Diagrammatic sections through the contact margin of, A, a bilamellar shell and, B, a monolamellar shell. (After Zalanyi.) FL, flange; H, hairs; IL, inner lamella; IM, inner margin; L, list; LC, line of concrescence; NPC, normal pore canals; OL, outer lamella; RPC, radial pore canals; SP, septa; SV, selvage; V, vestibule.

When the carapace is closed, the two valves are sealed by a projection termed the *selvage* ("Saum," fig. 2, SV), which, according to Fassbinder (1912), forms the outer margin in young individuals, but which at maturity may lie anywhere between outer and inner margins. Its exact position is variable in different parts of the shell and in different species (see fig. 3). The selvage may bear a very delicate *fringe* with comb-like thickenings (fig. 4, FR) Outside the selvage there is sometimes developed a *flange*, which may either form the outer margin (fig. 4, FL)

Fig. 3.



Diagrammatic sections through various types of contact margin in (A–E) bilamellar shells and (F–K) monolamellar shells. (After Zalanyi.)

or a projecting shelf on the outside of the shell behind the selvage when the selvage represents the outer margin. The groove which frequently develops between selvage and flange is termed the *flange groove* (fig. 4, FG), and the portion of the duplicature which forms the groove the *flange strip* (fig. 4, FS). Between the selvage and the inner margin there sometimes arises another projecting rim called the *list* ("Innenleiste," figs. 2 & 4, L). The groove between selvage and list is called the *selvage groove* (fig. 4, SG), and that portion of the duplicature the *selvage strip* (fig. 4, SS). The part of the duplicature lying between list and inner margin is termed the *list strip* (fig. 4, LS). The upper surface of the list strip occasionally exhibits a shallow fluting, with impersistent ridges between the grooves called *septa* (figs. 2 & 4, SP).

In some genera the shell is thickened to form a *marginal rim* round the periphery.

DESCRIPTIONS OF THE SELECTED TYPES.

Definitions.

In addition to the terms defined in the preceding section, the following words are used in an exact sense :—The *length* is measured from anterior to posterior, the *height* from dorsal margin to ventral margin. The *width* is the distance apart of the middle points of the right and left valves when they are opposed as in life. The word *thickness* always refers to the actual shell substance [as in Anderson (1939)].

CYPRIS O. F. Müller, 1776.

Genotype : *Cypris pubera* O. F. Müller.

Cypris pubera O. F. Müller.

1776. ? *Cypris pubera* O. F. Muller, ' Zoologicæ Danicæ Prodromus, seu Animalium . . . ,' p. 198.
1785. *Cypris pubera* [part.], O. F. Muller, 'Entomostraca seu Insecta Testacea . . .', pp. 56-8, pl. v. figs. 1–5.
1818. ? *Cypris conchacea,* Lamarck, ' Histoire naturelle des animaux sans vertèbres ', vol. v. p. 124.
1820. *Monoculus ovatus* Jurine, ' Histoire des Monocles,' p. 170, pl. xvii. figs. 5 & 6.
[Not *Monoculus puber* Jurine, *idem*, p. 171, pl. xviii.]
1825. *Cypris ovata* Desmarest, ' Considérations générales sur la Classe des Crustacés,' p. 383.
[Not *Cypris pubera* Desmarest, p. 383. *idem*.]
[Not 1837. *Cypris pubera* Baird, " The Natural History of the British Entomostraca " Mag. Zool. Bot. vol. i. (1836–8), p. 524, pl. xvi. figs. 1-13.]
1840. *Cypris ovata* Milne-Edwards, ' Histoire Naturelle des Crustacés,' vol. iii. p. 403.
? *Cypris puber* Milne-Edwards, *idem*, p. 403.
1844. *Cypris pubera* Zaddach, ' Synopseos Crustaceorum Prussicorum Prodromus,' p. 34.
Cypris striata (immature) Zaddach, *idem*, p. 32.
1850. ? *Cypris hamata* Haupt, " Ueber *Cypris* im Allgemeinen," ' Blatt des zoologisch-mineralogischen Vereines in Regensburg,' p. 150.

1850. *Cypris cuneata* (immature) Baird, "Descriptions of several new Species of Entomostraca." Proc. Zool. Soc. Lond. vol. xviii. p. 255, pl. xviii. figs. 22–4.

1851. *Cypris pubera* Fischer, "Abhandlung über das genus *Cypris*." 'Mémoires présentés à l'Académie Impériale des Sciences de St. Pétersbourg pàr divers savants,' vol. vii. (1854), pp. 154–6, pl. viii. figs. 1–8.

1853. *Cypris pubera* Liljeborg, 'Cladocera, Ostracoda et Copepoda in Scania occurrentibus,' pp. 108–10, pl. x. figs. 1–5.

1854. *Cypris puber* Zenker, "Monographie der Ostracoden." Arch. Naturgesch. Jahrgang 20, Band 1, pp. 70–2.

1858. *Cypris pubera* Chyzer, "Ueber die Crustaceen-Fauna Ungarns." Verh. Zool.-bot. Ges. Wien, Band 8, p. 510.

1862. *Cypris punctillata* Norman, "On Species of Ostracoda, found in Northumberland and Durham, new to Great Britain." Trans. Tyneside Nat. Fld. Club, vol. v. (1860–2), pp. 145–6, pl. iii. figs. 11–14: and Ann. & Mag. Nat. Hist. ser. 3, vol. ix. p. 43, pl. ii. figs. 11–14.

1868. *Cypris punctillata* Brady, "A Monograph of the Recent British Ostracoda." Trans. Linn. Soc. Lond., Zool. vol. xxvi. (1868–70), pp. 365–6, pl. xxvi. figs. 1–7; pl. xxxvi. fig. 11.

1868 *Cypris puber* Plateau, "Recherches sur les Crustacés d'eau douce de Belgique." Mém. Acad. Roy. Belg. vol. xxxiv. (1867–70), pp. 54, 55, fig. 25.

1871. *Cypris pubera* Heller, "Untersuchungen uber die Crustaceen Tirols." Ber. naturwiss. Ver. Innsbruck, vol. i. pp. 83–5.

[Not 1872. *Cypris pubera* Frič, "Die Krustenthiere Böhmens." Arch. f. naturw. LandesForsch. Bohm. Band 2, Teil 2, Section 4, p. 226, fig. 23.]

1889. *Cypris pubera* Brady & Norman, "Monograph of Marine and Freshwater Ostracoda of North Atlantic and North-Western Europe. Part I. Podocopa." Sci. Trans. R. Dublin Soc. vol. iv. ser. 2 (1888–92), p. 74. (*Designated as genotype.*)

1891. *Cypris pubera* Vávra, "Monographie der Ostracoden Böhmens." Arch. naturw. Landes Forsch. Böhm. Band 8, pp. 90–3, fig. 30.

1892. *Cypris pubera* Daday, "A Budapest Környékén Tenyésző Kagylósrákok." Természetr. Fuz. Budapest, vol. xv. pp. 91–2.

1892. *Cypris pubera* Daday, "Über die Ostracoden der Umgebung von Budapest." Természetr. Fuz. Budapest, vol. xv. pp. 294, 295.

1900. *Cypris pubera* Daday, "A magyarországi kagylósrákok magánrajza. Ostracoda Hungariæ." Magyar Tud. Akad. Kiadv. Budapest *.

1900. *Eurycypris pubera* G. W. Muller, "Deutschlands Süsswasser-Ostracoden." 'Zoologica,' N.Y. vol. xii. pp. 54, 55, pl. xiii. figs. 1–11.

1900. *Cypris unidentata* Cosmovici, "Contribution a l'Étude de la fauna de la Roumanie." Bull. Soc. zool. vol. xxv. p. 160, fig. 5.

1903. *Cypris pubera* R. W. Sharpe, "Report on the Freshwater Ostracoda of the United States National Museum." Proc. U.S. Nat. Mus. vol. xxvi. pp. 987–8, pl. lxvii.

1904. *Cypris pubera* Jensen, "Biologiske og systematiske Undersøgelser over Ferskvands-Ostracoder." Vidensk. Meddel.

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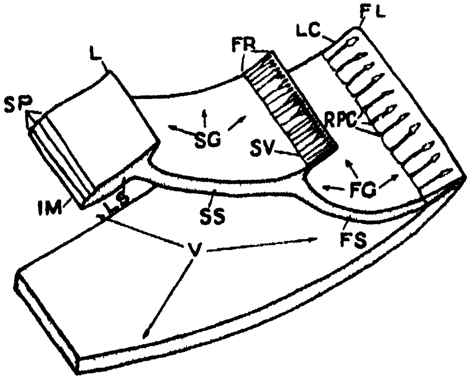
* I have not been able to verify this reference.

naturh. Foren. Kbh. 1904, pp. 44–5, pl. i.–iii. figs. 5–10, 12–15, 17, 18, 21, 22, and 25.
1909. *Eurycypris pubera* Vávra, "Ostracoda, Muschelkrebse." 'Die Süsswasserfauna Deutschlands,' Heft 11, p. 106, figs. 441, 442.
1912. *Cypris pubera* G. W. Müller, "Ostracoda." 'Das Tierreich,' Lief. 31, p. 179, figs. 52, 53.
1915. *Cypris pubera* Alm, "Monographie der Swedischen Susswasser-ostracoden." Zool. Bidr. Uppsala, vol. iv. pp. 45, 46, fig. 23.
1925. *Cypris pubera* Sars, "Ostracoda." 'An Account of the Crustacea of Norway,' vol. ix. (1922–8), pp. 111, 112, pl. li.
1925. *Eucypris pubera* Spandla, "Entomostraken von Borneo." Ann. Nat. hist. Mus. Wien, Band 38, pp. 92, 93, fig. 3, *a*, *b*.
1931. *Cypris pubera*, Monod. "Crustacés de Syrie," in A. Gruvel, 'Les États de Syrie,' p. 398, figs. 5/3 and 4.
1938. *Cypris pubera* Klie, "Ostracoda, Muschelkrebse." 'Die Tierwelt Deutschlands,' Teil 34, pp. 101, 102, figs. 355–9.

This is one of the largest species of European ostracods; at maturity it measures 2·4 mm. or more in length. In side view the outline of the carapace is approximately oval in shape; the dorsal margin is strongly arched, the highest point being a little anterior to the middle. The anterior margin is regularly curved, and the posterior tapers to a narrow, rounded end. The ventral margin is almost straight, but, especially in the left valve, is slightly indented in the anterior region at the point where

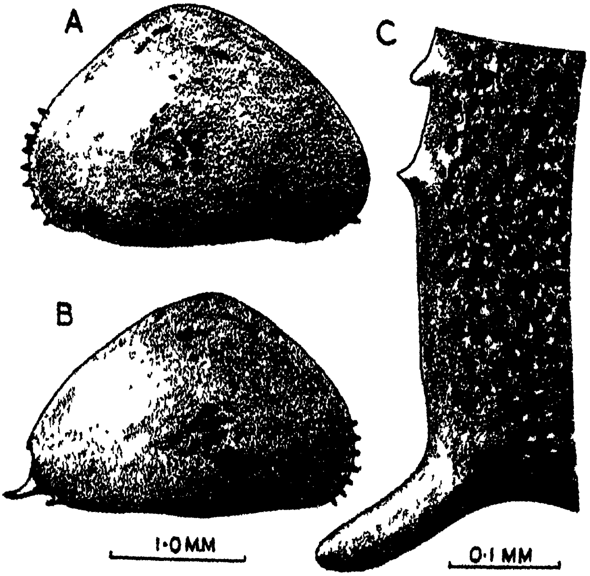
Fig. 4.



Diagrammatic section through anterior duplicature of left valve of *Cypris pubera*. FG, flange groove; FL, flange; FR, fringe; FS, flange strip; IM, inner margin; L, list; LC, line of concrescence; LS, list strip; RPC, radial pore canals; SG, selvage groove; SP, septa; SS, selvage strip; SV, selvage; V, vestibule.

the duplicature broadens (see fig. 5, A & B). In longitudinal section (fig. 12, E) the shell is evenly curved from the widest point, which is slightly posterior to the middle. The transverse section (fig. 12, F) is markedly tumid, and shows a flat, horizontal venter. The valves are about equal in size, the selvage of the left valve overlapping that of the right valve along the ventral margin when the valves are closed (fig. 6).

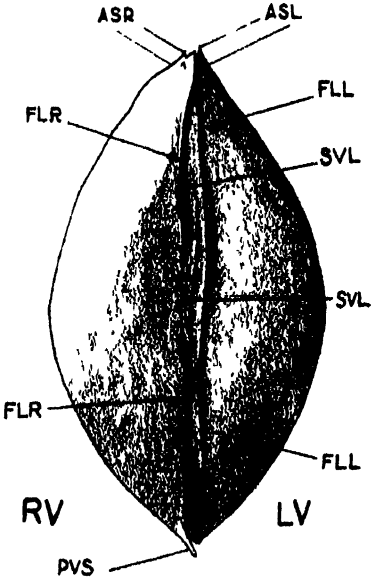
Fig 5



Cypris pubera. A, left valve, B, right valve, in side view, showing muscle scars; C, postero-ventral corner of right valve, enlarged to show surface ornament.

The surface of the carapace is very finely punctate all over (fig. 5, C). Between the punctæ are minute tubercles—the outlet of the normal pore canals, from which the long hairs of the living animal protrude. At the anterior end of both valves is a single curved row of from six to eight small spines; in the right valve these are set slightly back from the edge (fig. 6, ASR). At the posterior end of the right valve there is a large curved spur, flanked on either side by two or three small spines (fig. 5, B & C). This spur is delicate, and frequently breaks off short. The posterior end of the left valve sometimes bears one or two minute spines (fig. 5, A), but nothing to compare with the spur of the right valve.

Fig. 6.

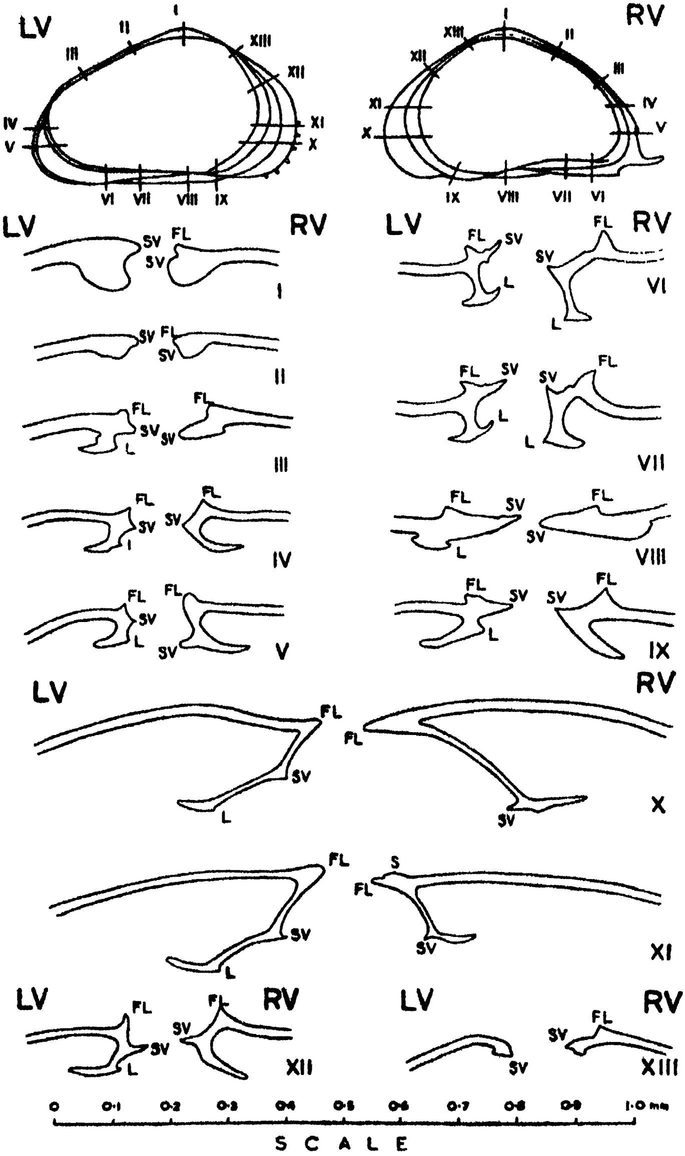


Cypris pubera: complete carapace, closed, seen from below.

ASL, anterior spines of left valve; ASR, anterior spines of right valve; FLL, flange of left valve; FLR, flange of right valve; LV, left valve; PVS, postero-ventral spur of right valve; RV, right valve; SVL, selvage of left valve (which overlaps, and therefore hides, the selvage of the right valve).

The contact margin is of type J (fig. 3). The details are illustrated by sections in fig. 7, in surface view in fig. 8, and diagrammatically in figs. 4 & 9. At the anterior end of the left valve the flange, the selvage, the well-developed list, and the inner margin are distinct and well separated from each other. The vestibule

Fig. 7.

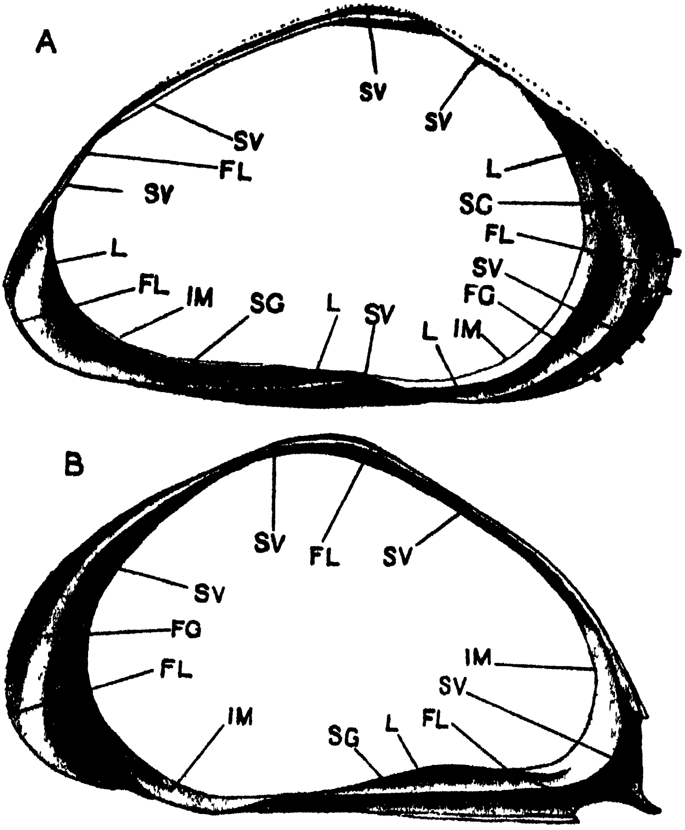


Cypris pubera: sections of the duplicature and hinge margin. I, II, hinge margin; III–XII, contact margin; XIII, transitional stage between hinge margin and anterior contact margin.

FL, flange; L, list; LV, left valve; RV, right valve; S, stump of anterior spine on right valve; SV, selvage.

is large and roomy, the line of concrescence lying but a short distance inside the flange (see fig. 7, x, and fig. 4). As the duplicature is traced round towards the venter, the flange strip will be seen to have been suppressed (fig. 7, IX), so that the flange of the venter is merely a ledge behind the outer edge of the shell—here formed

Fig. 8.

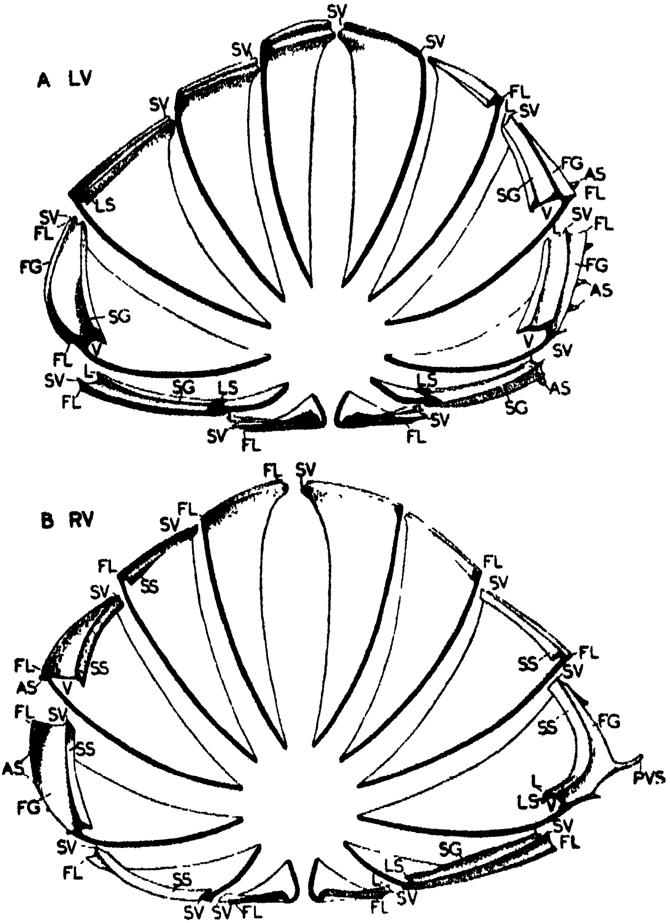


Cypris pubera: marginal details of A, left valve, and B, right valve, from the inside.

FG, flange groove ; FL, flange ; IM, inner margin ; L, list ; SG, selvage groove ; SV, selvage.

by the selvage (fig. 7, VIII). The selvage strip is almost entirely suppressed, so that the list acts as an inside ledge opposite the outside ledge of the flange (fig. 7, VIII, and

Fig. 9.



Cypris pubera: diagram of A, left valve, and B, right valve, segmented to show structure of duplicature and hinge margin.

fig. 10, C). The list strip at this point lies tight up against the outer shell, and there is no vestibule. As the ventral margin is traced further round towards the posterior, however, the selvage strip rapidly extends, and the selvage groove occupies almost the entire width of the posterior duplicature. The flange remains as but a ledge outside the selvage, and the list strip is almost vertical when the carapace is viewed from the side, and so is hardly noticeable in fig. 8. As the posterior hinge margin is approached (fig. 7, III) the flange is suppressed, as is the list strip. The list is markedly thickened and forms the inner edge to a groove flanked on the outside by the selvage (fig. 7, I & II). The whole of this thickened hinge margin dies away before the anterior free margin is developed, so that for a short space the antero-dorsal margin is simple (fig. 7, XIII).

The anterior margin of the right valve is different to that of the left in that there is no list. The flange groove is wide, the selvage groove taking the place of the list strip of the left valve (fig. 7, X, XI, & XII).

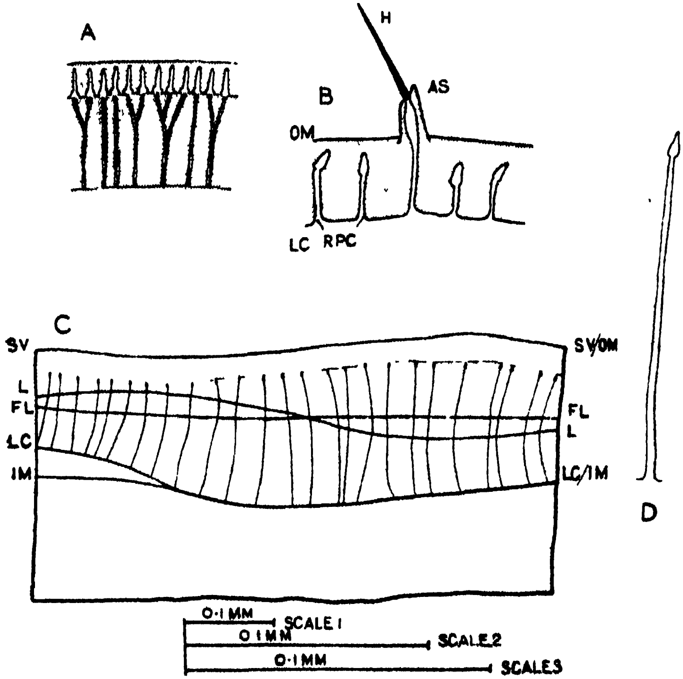
The compressed ventral region is similar to that of the left valve except for the absence of list (fig. 7, VIII). Immediately behind this point, however, a list is developed (fig. 7, VI & VII) and a wide selvage groove obscures the list strip when the carapace is viewed from the side (fig. 8). The list is again suppressed at the posterior end (fig. 7, IV & V), but the flange groove is here much wider than in the left valve (fig. 7, IV–VII). The flange is not suppressed along the dorsal margin, but forms the outer edge of the dorsal groove, the selvage forming the inner edge. The dorsal margin is thickened as in the left valve. The flange continues to the anterior margin, so there is no simple edge to the right valve as in the left.

It will be noticed that there is no development of teeth along the hinge margin. Each valve has a simple groove, with a greatly thickened inner lip. In the left valve the outer edge of the groove is formed by the continuation of the selvage, whereas in the right valve the selvage forms the inner edge of the groove.

The radial pore canals are illustrated in fig. 10, B, C, & D; they widen out at their extremities (perhaps thus forming a socket for the hairs). The marginal spines also give passage to a canal, and bear a hair. They are not pointed, but are terminated with a diagonal scallop from which the hair protrudes as shown in fig. 10, B. The selvage bears a delicate fringe (fig. 10, A) traversed by comb-like thickenings or striations. It is very easily broken.

The normal pore canals are small and numerous, and are scattered irregularly over the surface of the carapace.

Fig. 10.



Cypris pubera: A, the fringe to the selvage; B, the anterior margin, showing radial pore canals; C, the ventral margin by transmitted light, showing radial pore canals; D, an individual radial pore canal from the ventral region.

A and B to Scale 3; C to Scale 1; D to Scale 2.

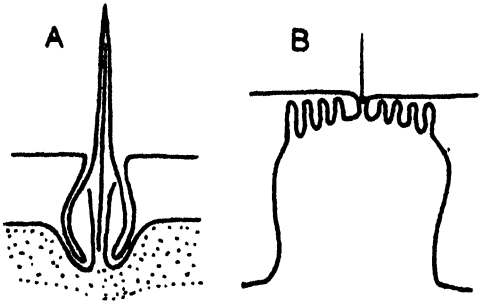
AS, anterior marginal spine; FL, flange; H, hair; IM, inner margin; L, list; LC, line of concrescence; OM, outer margin; RPC, radial pore canals; SV, selvage.

On the outside they are marked by minute pustules (fig. 5, C). Fig. 11, A, shows a section through a normal pore canal as diagrammatically figured by Fassbinder (1912).

The shell of *Cypris pubera* is very thin and delicate for the size of the carapace. The proportion of thickness of shell to length of carapace is 0·006 : 1.

There is a central group of seven large muscle scars (fig. 5, A & B). Each scar is irregular in shape, but the pattern of arrangement is constant for the species. There is a vertical row of three in front, with two behind and two diagonally below and in front. In addition to these seven large scars, there are two minute spots below, at each side of the bottom hindmost large scar. There are also a number of small elongate scars above the central group and close to the dorsal margin, situated as shown in fig. 5, A & B.

Fig. 11.



Diagrammatic sections through normal pore canals. A, of *Cypris pubera* (after Farstruder), B, of the sieve type (e. g. *Cythere lutea*) (after G. W. Müller).

Most of the specimens of *Cypris pubera* examined in this paper are fossils from beds at Bilsham, Sussex, probably Pleistocene in age.

Specimens from the Rev. A. M. Norman's collection have also been examined.

CANDONA Baird, 1845.

Genotype : *Cypris candida* O. F. Müller.

Candona candida (O. F. Müller).

1776. ? *Cypris candida* O. F. Müller, ' Zoologicæ Danicæ Prodromus seu animalium, . . . ,' p. 199.

1785. *Cypris candida* (part.), O. F. Müller, ' Entomostraca seu Insecta Testacea, . . . ; p. 62, pl. vi. figs. 7–9.

1789. *Monoculus candidus* (part.), Gmelin, Linne's 'Systema Naturæ,' 13th edition, tom. 1, pars 5, p. 3002.

1820. ? *Monoculus candidus* Jurine, 'Histoire des Monocles,' p. 176, pl. xix. figs. 7 & 8.

1835. *Cypris lucens* Baird, "List of Entomostraca found in Berwickshire." Hist. Berwicksh. Nat. Cl. vol. i. p. 100, pl. iii. fig. 15.

1837. ? *Cypris pellucida* Koch, 'Deutschlands Crustaceen, Myriapoden und Arachniden,' Heft 11, Nr. 5; and in Panzer's 'Deutschlands Insecten,' Heft 146, pl. v.

1845. *Candona candida* (part.) Baird, "Arrangement of the British Entomostraca." Hist. Berwicksh. Nat. Cl. vol. ii. (1842-9), p. 153.

1850. *Candona lucens* Baird, "Natural History of the British Entomostraca." Ray Society, p. 160, pl. xix. fig. 1.

1851. ? *Cypris pellucida* Fischer, "Abhandlung uber das genus *Cypris*." Mem. Acad. Sci. St. Pétersb. vol. vii. (1854), pp. 149–50, pl. v. figs. 1–4.

(Not 1853. *Candona candida*, Lilljeborg, 'Cladocera, Ostracoda et Copepoda in Scania occurrentibus,' pp. 127–9, pl. xi. figs. 19, 20; pl. xxv. figs. 13–15.)

1854. *Cypris candida* Zenker, "Monographie der Ostracoden." Arch. Naturgesch. Jahrgang 20, Band 1, p. 76, pl. i. figs. 1–10.

1856. *Candona candida* Jones, "Monograph of the Tertiary Entomostraca." Pal. Soc. pp. 19, 20, pl. i. figs. 5, 8.

1858. *Cypris candida* Chyzer, "Ueber die Crustaceen-Fauna Ungarns." Ver. zool.-bot. Ges. Wien, Band 8, p. 511.

1868. *Candona candida* (part.) Brady, "A Monograph of the recent British Ostracoda." Trans. Linn. Soc. Lond., Zool. vol. xxvi. (1868–70), pp. 383–4, pl. xxv. figs. 1–9; pl. xxxvi. fig. 13; pl. xxxvii. fig. 1.

? *Cytheridea zetlandica* Brady, *idem*, pp. 428–9, pl. xxviii. figs. 42–6.

1871. ? *Candona candida* Heller, "Untersuchungen über die Crustaceen Tirols." Ber. naturwiss. med. Ver. Innsbruck, vol. i. pp. 94–6.

1872. *Cypris candida* Fric, "Die Krustenthiere Bohmens." Arch. Naturw. LandesForsch. Bohm. Band 2, Teil 2, Section 4, p. 27, fig. 25.

1874. *Candona candida* Brady, Crosskey & Robertson, "Monograph of Post-Tertiary Entomostraca." Pal. Soc. pp. 135–6, pl. xi. figs. 29, 30.

1885. *Candona lucens* Forel, "La faune profonde des lacs Suisses." Nouveaux Mémoires de la Soc. Helvetique des Sciences Naturelles, vol. xxix. pp. 115-16. (As N. Denkschr. schweiz. Ges. Naturw. Zürich in World List.)

1885. *Candona lucens* Plessis-Gouret, "Essai sur la faune profonde des lacs de la Suisse." Nouveaux Mémoires de la Soc. Helvetique des Sciences Naturelles, vol. xxix. p. 45

1888. *Candona candida* Sostaric, "Prilog poznavanju faune slatkovodnich koropnjaka Hrvatske." Rad Jugoslavenske Akademije, Knjiza 92, p. 151.

1889. *Candona candida* (part.) Brady & Norman, "Monograph of Marine and Freshwater Ostracoda of North Atlantic and North-Western Europe.—Part I. Podocopa." Sci. Trans. Dublin Soc. vol. iv. ser. 2 (1888–92), pp. 98–9, pl. x. figs. 1, 2, & 14–23. (*Designated as genotype*).

1891. *Candona candida* Vavra, "Monographie der Ostracoden Böhmens." Arch. der naturw. LandesForsch. Böhm. Band 8, pp. 48–51, fig. 14.

1892. *Candona candida* Daday, "A Budapest Kornyeken Tenyeszo Kagyloarakok." Termeszetr. Füz. Budapest, vol. xv. pp. 103–4.

1892. *Candona candida* Daday, " Über die Ostracoden der Umgebung von Budapest." Termeszetr. Füz. Budapest, vol. xv. pp. 305–6.

1893. *Candona candida* Kaufmann, " Die Ostracoden der Umgebung Berns." Mitt. naturf. Ges. Bern, 1892 [1893], p. 72.

1893. *Candona candida* Fric & Vavra, "Untersuchungen über die fauna der Gewasser Bohmens.—IV. Die Thierwelt des Unterpocernitzer und Gatterschlager Teiches." Arch. naturw. LandesForsch. Bohm. Band 9, Nr. 2, p. 109, figs. 75/1 and 2.

1893. ? *Candona granulata* Daday, " Adatok az alfoldi szekes vizek mikrofaunajanak Ismeretehez." Math. term. Ért. Budapest, vol. xii. pp. 41, 42, pl. ii. figs. 3–7.

1895. ? *Candona candida* Croneberg, " Beitrag zur Ostracodenfauna der Umgegend von Moskau." Bull. Soc. Nat. Moscou, n.s. vol. viii. (for 1894), pp. 288 9, pl. vii. fig. 1.

1897. *Candona candida* Chapman, " Ostracoda from the *Chara*-marl of Hitchin." Ann. & Mag. Nat Hist. 6th series, vol. xix. pp. 595–6, pl. xv. figs. 20, 21.

1898. *Candona candida* Lien en klaus, "Erster Beitrag zur kenntnis der Ostrakoden-Fauna des Regierungsbezirks Osnabruck." Jber. naturw. Ver. Osnabruck, 12th year for 1897 (1898), p. 113.

1899. *Candona candida* Hartwig, " Die nierderen Crustaceen des Musselsees und des Saaler Boddens wahrend des Sommers, 1897." ForschBer. biol. Sta. Plon, Teil 7, pp. 32, 33.

1900. ? *Candona candida* Daday, " A magyarorszagi kagylosrakok maganrajza. Ostracoda Hungariæ." Magyar Tud. Akad. Kiadv. Budapest, p. 268.

1900. *Candona candida* G. W. Muller, "Deutschlands Susswasser-Ostracoden." 'Zoologica,' N.Y. vol. xii. pp. 15, 16, pl. ii. figs. 1-3, 7-12.

1900. *Candona candida* Kaufmann, " Cypriden und Darwinuliden der Schweiz." Rev. suisse Zool. Tome 8, pp. 379-83, pl. xxvii. figs. 10-13 ; pl. xxviii. figs. 18 25.

(Not 1902. *Candona candida* Capeder, "Contribuzione allo studio degli Entomostraci Ostracodi dei terreni miocenici del Piemonte." Atti Accad. Torino, vol. xxxvii. (1901–2), p. 17, fig. 35.)

1904. *Candona candida* Jensen, " Biologiske og systematiske Undersøgelser over Ferskvands-Ostracoder." Vidensk. Medd. naturh. Foren. Kbh. 1904, p. 62.

1907. *Candona candida* Cushman, " Ostracoda from S.E. Massachusetts." Amer. Nat. vol. xli. p. 38.

1909. *Candona candida* Vavra, " Ostracoda, Muschelkrebse." 'Die Susswasserfauna Deutschlands,' Heft 11, p. 89, figs. 347–52.

1910. *Candona candida* (part.) Brady, " Revision of British Species of Ostracod Crustacea belonging to the subfamilies Candoninæ and Herpetocypridinæ." Proc. Zool. Soc. Lond. 1910, pp. 196–7, pl. xix. figs. 1–11.

1912. *Candona candida* G. W. Müller, "Ostracoda." 'Das Tierreich,' Lief. 31, p. 135.

1915. *Candona candida* Alm, " Monographie der Swedischen Süsswasserostracoden." Zool. Bidr. Uppsala, vol. iv. pp. 111–14, figs. 60, 61.

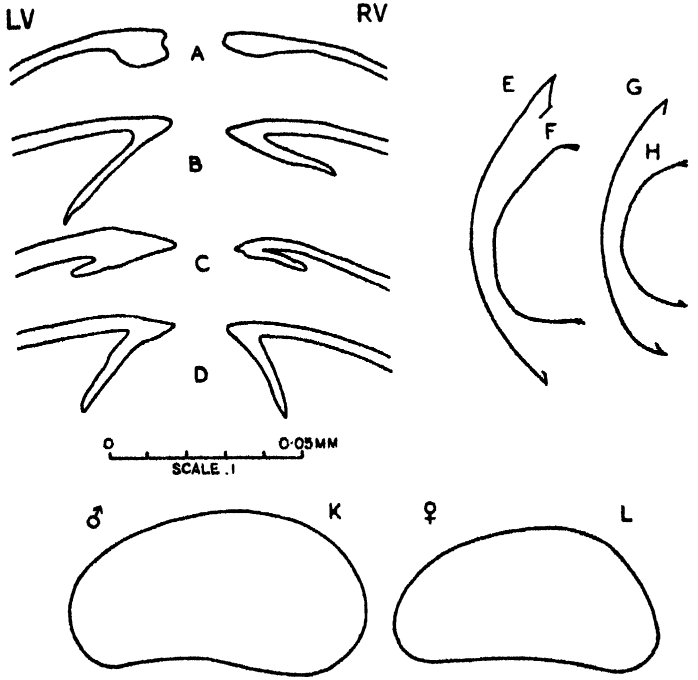
1920. *Candona candida* Wolf, " Die Ostracoden von Basel." Arch. Naturgesch. Jahrgang 85 (1919), Abteilung A, Heft 3, pp. 66–72, figs. *a–g*.

1923. *Candona candida* Sars, 'An Account of the Crustacea of Norway.—Vol. IX. Ostracoda' (1922–8), pp. 72–3, pls. xxxii., xxxiii.

1938. *Candona candida* Klie, "Ostracoda, Muschelkrebse." 'Die Tierwelt Deutschlands,' Teil 34, pp. 26–28, figs. 31–8.

The carapace is reniform. The shell of the female is arched in the posterior third of the dorsal margin, and produced to a fairly narrow posterior at the postero-ventral corner. The anterior is regularly curved, the ventral margin sinuate. The shell of the male is larger,

Fig. 12.



A–D. Sections through A, dorsal, B, anterior, C, ventral, and D, postero-ventral margins of *Candona candida*, drawn to Scale 1.
E, longitudinal, and F, transverse sections through carapace of *Cypris pubera*.
G, longitudinal, and H, transverse sections through carapace of *Candona candida* (not to same scale as E and F)
K and L, carapace of K (male) and L (female) of *Candona candida*, seen in side view.

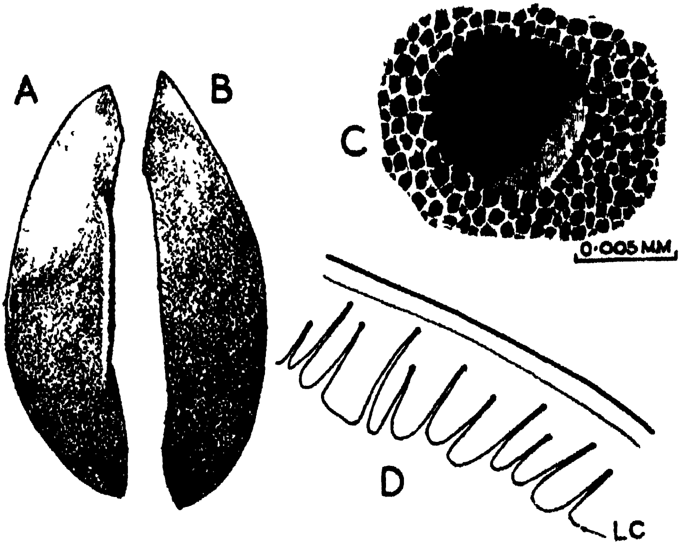
and the posterior is broadly rounded, not produced as in the female (see fig. 12, K & L). The left valve is very slightly larger than the right, and overlaps it round all margins. In longitudinal section (fig. 12, G) the greatest width is in the posterior third, the posterior being bluntly curved, the anterior narrow. The transverse section (fig. 12, H) is almost a semi-circle, though the greatest width is just below the centre. The usual length of the adult male is 1·2 mm., the female 1·1 mm. *Proportions.*—Male: length, 1·76; height, 1; width, 0·78 mm. Female: length, 1·85; height, 1; width, 0·83 mm.

The calcareous matter of the carapace is perfectly smooth and usually appears polished, but the outside of the shell is covered by a minutely reticulate chitinous integument (fig. 13, C); a much larger reticulation (about ten times the size of the small one) can sometimes be seen as a shadowy background. The contact margin (which is of type F (fig. 3)) shows a wide, simple duplicature (fig. 14). The selvage coincides with the outer margin, and the line of concrescence is close to it. A straight selvage strip widens out at the anterior and postero-ventral ends, being much compressed in the central region. There is no flange or list. The funnel-shaped radial pore canals are numerous and regularly spaced (fig. 13, D). The normal pore canals are small (fig. 13, C). They appear to open into the *inside* of the shell through minute projections or spines. The shell is thin and delicate. Proportions of thickness to length, 0·009 : 1.

The hinge margin of the left valve is a simple groove formed by the development, for the length of the hinge, of a flange outside the selvage (fig. 13, A). The dorsal margin of both valves is thickened in the region of the hinge as it was in the case of *Cypris pubera*, but the right valve is otherwise simple, though sections show in some individuals the suggestion of a very narrow groove.

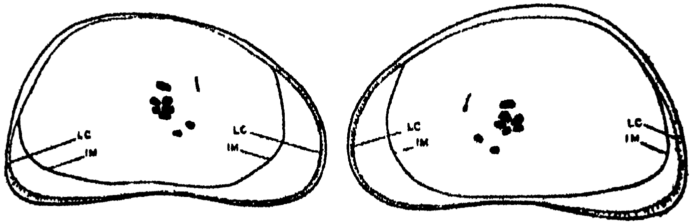
The muscle scars appear to be characteristic of the Candoninæ. There is a central cluster of five oval scars, three in front and two behind. Above these, and a little separated from them, lies another large oval scar. Diagonally below and in front of them are a further two scars, and above and in front is a narrow elongate scar (fig. 14).

Fig. 13.



Candona candida: A, B, left and right valves seen from above, showing development of a flange to the hinge margin of the left valve. (The two valves are not from the same specimen.)
C, integument and normal pore canal seen in surface view under high power.
D, radial pore canals, line of concrescence (LC) and outer margin.

Fig. 14.



Candona candida: A (left valve), and B (right valve) from the inside to show muscle scars and duplicature.

IM, inner margin; LC, line of concrescence.

CYTHERE O. F. Müller, 1785.

Genotype : *Cythere lutea* O. F. Müller.

Cythere lutea O. F. Müller.

1785. *Cythere lutea* O. F. Muller, 'Entomostraca seu Insecta Testacea . . . ,' p. 65, pl. vii. figs. 3, 4.

1788. *Monoculus luteus* Gmelin, Linne's 'Systema Naturæ,' 13th edition, tom 1, pars 5, p. 3001.

1818. *Cytherina lutea* Lamarck, 'Histoire naturelle des animaux sans vertébres,' vol. v. p. 125.

1835. *Cythere reniformis* Baird, "List of Entomostraca found in Berwickshire." Hist. Berwicksh. Nat. Cl. vol. i. p. 98, pl. iii. fig. 5.

1837. *Cythere reniformis* Baird, "Natural History of the British Entomostraca." Mag. Zool. Bot. vol. ii. (1837–8), p. 142, pl. v. figs. 16–22.

1850. *Cythere reniformis* Baird, "Natural History of the British Entomostraca." Ray Society, p. 169, pl. xx. fig. 5.

1854. *Cythere lutea* Zenker, "Monographie der Ostracoden." Arch. Naturgesch. Jahrgang 20, Band 1, pp. 83, 84, pl. v., *c*.

1855. *Cythere Zenkeri* Fischer, "Beitrage zur Kenntniss der Ostracoden." Abh. bayer. Akad. Wiss. Band 7, p. 656.

(Not *Cythere lutea* Fischer, *idem*, pp. 658–9, pl. xx. figs. 13, 14, & 17 *b*.)

1866. *Cythere setosa* Brady, "On new and imperfectly known Species of Marine Ostracoda." Trans. Zool. Soc. Lond. vol. v. (1862–6), p. 372, pl. lviii. figs. 12, 13, & 15.

1866. *Cythere lutea* Sars, "Oversigt af Norges marine Ostracoder." Forh. Vidensk. Selsk. Krist. Aar 1865 [1866], pp. 28, 29.

1868. *Cythere lutea* Brady, "A Monograph of the recent British Ostracoda." Trans. Linn. Soc. Lond., Zool. vol. xxvi. (1868-70), pp. 395, 396, pl. xxviii. figs. 47–56; pl. xxxix. fig. 2.

Cythere viridis (immature) Brady, *idem*, p. 397, pl. xxviii. figs. 40, 41, 50–55 *d*; pl. xxxviii. fig. 8.

1874. *Cythere lutea* Brady, Crosskey, and Robertson, "Monograph of Post-Tertiary Entomostraca." Pal. Soc. p. 148, pl. iii. figs. 1–6.

(Not 1880. *Cythere lutea* W. Muller, "Beitrag zur Kenntniss der Fortpflanzung und der Geschlechtsverhältnisse der Ostracoden." Z. ges. Naturwiss. Band 53 (ser. 3, Band 5), pp. 237–8, pl. v. fig. 1.)

1885. *Cythere lutea* Carus, 'Prodromus Faunæ Mediterraneæ.' Stuttgart, vol. i. p. 294.

1888. *Cythere lutea* Dahl, 'Die Cytheriden der westlichen Ostsee.—I. Syst. geographie und biologie der Thiere.' Zool. Jb. pp. 605–7, pl. i. figs. 1–12, 27–9.

1889. *Cythere lutea* Brady & Norman, "Monograph of Marine and Freshwater Ostracoda of North Atlantic and North-Western Europe.—Part I. Podocopa." Sci. Trans. Dublin Soc. vol. iv. ser. 2 (1888–92), p. 125. (*Designated as genotype.*)

1912. *Cythere lutea* G. W. Müller, "Ostracoda." 'Das Tierreich,' Lief. 31, p. 318.

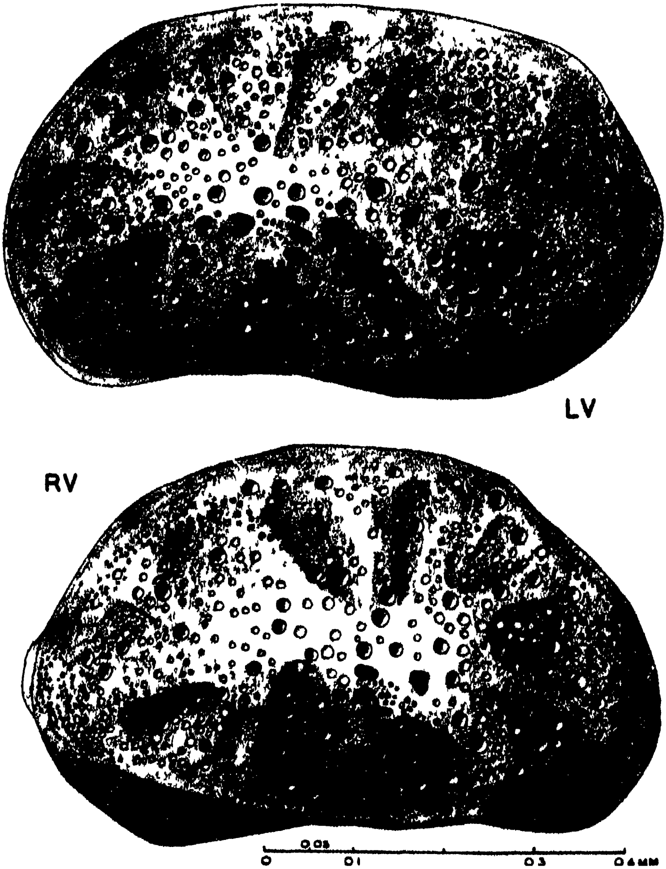
1925. *Cythere lutea* Sars, "Ostracoda." 'An Account of the Crustacea of Norway,' vol. ix. (1922–8), pp. 167–8, pl. lxxvii.

1931. *Cythere lutea* Blake, "Notes on Ostracoda." J. Palæont. vol. v. pp. 160, 161, fig. 1, *b–e*.

1938. *Cythere lutea* Klie, "Ostracoda, Muschelkrebse." 'Die Tierwelt Deutschlands,' Teil 34, pp. 164, 165, figs. 544–7.

The adult specimen measures a little over 0·8 mm. *in length. Male and female are of about the same length, but the shell of the male is not so high as that of the* female (see proportions given below) The carapace of the left valve is regularly oval in side view, the ventral margin being slightly sinuate. The dorsal margin of the right valve is heightened in the anterior third, there is

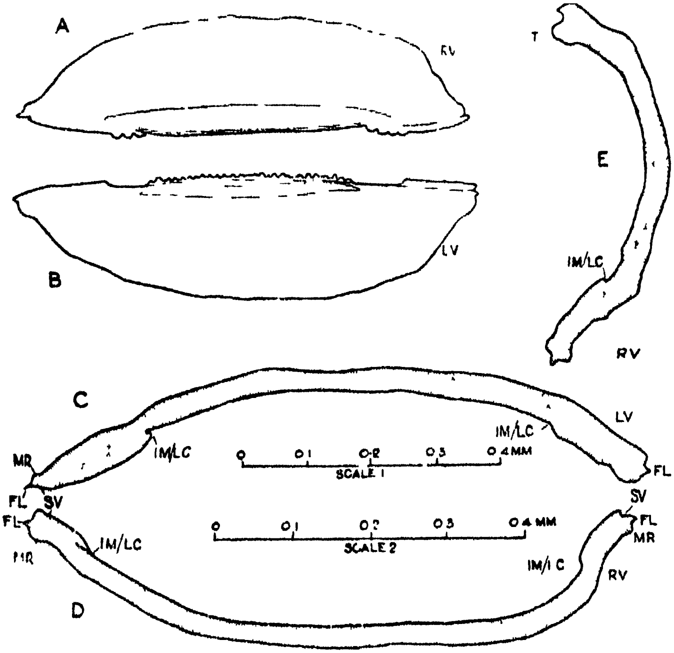
Fig. 15



Cythere lutea : surface of carapace from the side, showing ornamentation and muscle scars.

a broad, square projection of the posterior margin, and the ventral margin is more obviously sinuate (fig. 15). *The shell is somewhat compressed, and, as seen in section (fig. 16, C, D, & E) slopes steeply towards dorsal, ventral, and posterior margins. The margin of the right* valve projects over that of the left in the region of the hinge. The left valve very slightly overlaps the right in the region of the contact margin.

Fig. 16.



Cythere lutea: A, B, carapace from above, showing hinge structure of A, right valve, and B, left valve.
C, D, longitudinal sections of C, left valve, and D, right valve.
E, transverse section of right valve in region of anterior hinge teeth. A and B to Scale 1; C, D, and E to Scale 2.

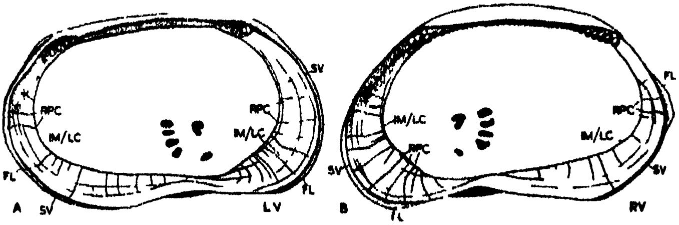
FL, flange; IM/LC, inner margin and line of concrescence (coincident); LV, left valve; MR, marginal rim; RV, right valve; SV, selvage; T, hinge tooth.

Proportions.—Male: length, 1·69; height, 1: width, 0·73 mm. Female: length, 1·56; height, 1; width, 0·71 mm.

The shell is very thick compared with the freshwater species already described (thickness of shell : length of carapace$=0{\cdot}035:1$; *i. e.* over five times as thick as *Cypris pubera*). The most noticeable surface ornament is due to the large apertures of the normal pore canals, but in between these are numerous smaller punctæ ; the smallest are arranged in regular rows behind the anterior and posterior margins (fig. 15).

Superimposed over this ornamentation is a circle of indentations which reach out as bays from the margins of the shell towards the widest point of the carapace at the centre of each valve. This indentation is easily overlooked in most specimens, but in a few (those that appear white and opaque by reflected light) it stands out very clearly. Brady noticed this (1868, p. 396 · "the marginal portions tend . . . to become elevated into irregularly radiating ribs" ; see his pl. xxviii fig. 47), and at first thought he was dealing with two different species. Actually, if the specimens which do not appear to show this sculpture are coated with a sublimate of ammonium chloride it will immediately become apparent.

Fig. 17.



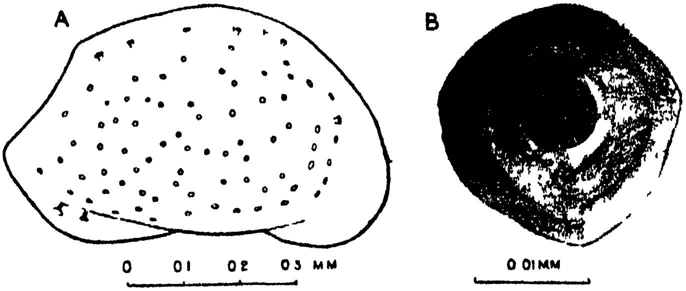
Cythere lutea : A, left valve, and B, right valve from inside. FL, flange ; IM/LC, inner margin and line of concrescence (coincident) ; LV, left valve , RPC, radial pore canals ; RV, right valve , SV, selvage.

A blunt ridge is developed along the ventral region of both valves.

The contact margin is of type E (fig. 3). The inner margin coincides with the line of concrescence throughout, so that there is no vestibule. The duplicature, however, is broad, and is traversed by a few well-separated sinuous radial pore canals, which very slightly thicken in their middle part (fig. 17). A narrow, ill-defined flange develops outside the selvage; it widens in the centre of the posterior margin of the right valve, and is responsible for a projection of the outer margin, which calls to mind the caudal process developed in *Cytherura* and other related genera. A study of the sections shows that outside the flange round the whole extent of the contact margin there is a marginal rim (fig. 16, C, D, & E); this is developed to a greater extent in other genera (e. g. *Cythereis*).

The normal pore canals are very large (fig. 18). They are of the "sieve type" of G. W. Müller (1894) (fig. 11, B). Seen from above, from the outside, a funnel-shaped opening leads down to a reticulate base, with a striated margin, and with a minute opening in the centre.

Fig. 18.



Cythere lutea: the normal pore canals. A, right valve from outside by transmitted light to show their arrangement; B, a single pore canal seen from the outside, highly magnified.

The hinge of *Cythere* is well developed, and has been figured and described many times (*e. g.* Brady, 1868, pl. xxviii. figs. 51, 56; and Blake, 1931, fig. 1, *b*, *c*, & *e*). The hinge line is almost straight. In the right valve a flange is developed above the actual elements of the hinge (fig. 16, A & E; fig. 17, B). The hinge is divided into three sections: (1) at the anterior end is a series of from four to five rounded projecting teeth in the right valve, with corresponding sockets in the left valve; (2) in the middle and longest region of the hinge a projecting crenulate bar in the left valve fits into a low, socketed shelf in the right valve; (3) the posterior region is similar to the anterior: five or six rounded projecting teeth in the right valve fit into corresponding sockets in the left.

The muscle scars consist of an almost vertical row (slightly inclined towards the antero-ventral corner) of four horizontally elongated oval scars lying anterior to and below the centre of the valve. Two other scars lie in front of these in parallel allignment. The bottom one is oval, and the dorsal one the shape of a crook opening towards the antero-ventral corner (fig. 17).

SUMMARY.

Fossil Ostracoda suitably treated exhibit the same details of shell structure that are evident in recent species. A technique of collection, preparation, and examination of recent and fossil forms is described. Variations of shell structure displayed by these methods are reviewed, and an English terminology, derived mostly from terms already introduced, is proposed. The genotypes of the three well-known genera *Cypris*, *Candona*, and *Cythere* are described in detail as examples.

ACKNOWLEDGMENTS.

The laboratory work for this paper was, by the kindness of the authorities concerned, undertaken in accommodation provided by the British Museum (Natural History) and H.M. Geological Survey and Museum. Specimens for investigation were provided from the collections of the British Museum and by Mr. A. S. Kennard. Dr. Isabella Gordon, Dr. J. P. Harding, and Professor T. M. Harris have contributed valuable suggestions as to the technique of preparation and illustration. Professor K. Wodzicki has helped the author with translations. Mr. J. D. McKay prepared the drawing from which fig. 1 is reproduced. Professor H. L. Hawkins has given the paper careful scrutiny. To all these persons I should like to express my deep gratitude.

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II.—*New* Curculionidæ (*Col.*) *from Uganda.*

By Sir **Guy A. K. Marshall**.

The new species described below have nearly all been received through the Government Entomologist, Uganda, and the types will be deposited in the British Museum.

Subfamily *Otiorrhynchinæ*.

Ischnobrotus rhombifer, sp. n. (Fig. 1.)

♂♀. Derm piceous, with dense grey or brownish-grey scaling ; elytra with a very large sub-rhombic brown patch covering most of the disk, the lateral angles extending to stria 5 or 6, the angles on the suture reaching the base and the top of the declivity ; this rhombus is often very indistinct, especially in the ♂, and the sides subtending the posterior angle are always much more distinct than the others, being bordered with darker brown and more or less sinuous.

Head unusually narrow, the width across the slightly convex eyes being no greater than that of the rostrum at the genæ, separated from the rostrum by an angulated incision, the forehead flat, with a short stria. *Rostrum* much longer than the head, as long as broad, gradually widening from the base to the genæ; the dorsal area gradually narrowing from base to apex, the part between the scrobes not impressed and not wider (at its narrowest) than the apex of the scape. *Antennæ* with the scape comparatively short, very stout, gradually widening from base to apex, with dense overlapping scales and stout subrecumbent setæ; funicle squamose, with joints 1 and 2 equal, 4–7 subequal, about as long as broad, moniliform. *Prothorax* transverse (11 : 14), gently rounded laterally,

Fig. 1.

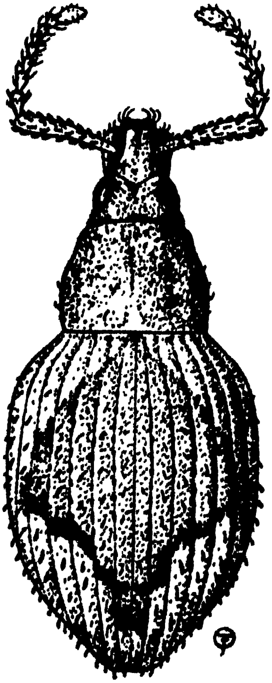


Fig. 1.—*Ischnobrotus rhombifer*, sp. n., ♀.

widest at a little behind the middle, not constricted at the apex, feebly arcuate at the base ; the densely squamose dorsum with a very shallow median sulcus containing a round impression beyond the middle, and on each side of it two rounded sublateral depressions, one before and the other behind the middle ; the short squamiform setæ appressed. *Elytra* simply ovate, almost similar in the two sexes, without any subhumeral callus, the bare scutellar callus reduced to a narrow marginal line extending to stria 2 ; dorsum rather strongly convex longitudinally, highest at about the middle, the rather broad striæ with shallow separated punctures but so much covered with scaling as to be reduced to a very narrow line ; the intervals without elevations, convex, with dense overlapping round convex fluted scales and a row of stout erect setæ, which become short, scale-like and subrecumbent on the basal fourth. *Legs* piceous (tarsi paler), with dense grey or brownish scaling, the two posterior pairs of femora with a dark median band.

Length 4·0–4·5 mm., breadth 2·0–2·2 mm.

UGANDA : Valley of Ngusi R., Unyoro, 3000–3400 ft., 2 ♂♂, 3 ♀♀, xi. 1911 (*Dr. S. A. Neave*—type) ; Bugoma Forest, Unyoro, 2 ♂♂, 5 ♀♀, xii. 1911 (*S. A. N.*).

Most nearly allied to *I. gedyei* Mshl. (J. E. Afr. Ug. N. H. Soc. xv. 1940, p. 41, pl. ix, fig. 2), which, apart from its different colour-pattern, differs in its broader elytra, with distinct subhumeral and subapical calli, and the greater elevation of the alternate intervals.

Subfamily *TANYRRHYNCHINÆ*

Euonychus conorrhinus, sp. n.

♂♀. Derm black to red-brown, with uniform dense grey scaling (typical form) ; sometimes the pronotum with a faint broad light brown median stripe and a narrower abbreviated darker stripe on each side in the basal half, and the elytra with some short brown lines in the striæ.

Head continuous with the rostrum, with a fine median stria extending right up to the vertex ; eyes convex, projecting laterally beyond the temples. *Rostrum* a little shorter than the pronotum (7 : 8), slightly curved, about as broad at the base as the wide forehead, rapidly narrowing to the middle and more gradually in the apical half; dorsum almost flat, shallowly depressed, the margins abruptly angulate, converging in front more rapidly than do the sides of the rostrum so that they extend on to the disk as oblique carinæ to a little beyond the antennæ, the deep median stria normally quite hidden by scaling and terminating basally in a fovea; the lateral areas with rather sparse scaling which is frequently abraded, the median part bearing variable subconfluent punctures; submentum abnormally developed, being produced forwards and bent so as to overhang the buccal cavity, its apical margin broadly truncate and partly concealing the small immersed mentum. *Antennæ* red-brown; scape very stout, rapidly widening from base to apex, reaching to about the middle of the eye; joint 1 of the funicle nearly as long as 2+3+4. *Prothorax* transverse (2 : 3), rounded laterally, broadest well behind the middle, without any apical constriction, strongly arcuate at the base, which is nearly twice as broad as the feebly arcuate apex; the dorsum gently convex longitudinally, strongly convex transversely, smooth, with a median stria which does not reach the apex and is partly concealed by the dense scaling; the very short scale-like setæ subrecumbent. *Elytra* broad, subrotund, widest at the middle, feebly constricted at the base, which is broadly sinuate; the dorsum almost flat in the basal half in ♂, much more convex in ♀, steeply declivous behind; the shallow striæ partly covered by scaling with the bare round isolated punctures showing through it; the intervals broad, almost flat, with an irregular row of short scale-like recumbent white setæ. *Legs* piceous, with dense grey scales, the tarsi red-brown; front tibiæ with a row of three or four stout sharp spinose teeth on the lower edge and one or two smaller ones on the middle pair.

Length 3·3–4·5 mm., breadth 2·0–2·5 mm.

Uganda: Madi, 4 ♂♂, v. 1927 (*Dr. G. D. H. Carpenter*), E. Lake Albert, 5 ♂♂, 6 ♀♀, xi. 1921 (*G. D. H. C.*).

The two previously-described species of the genus, *sulcirostris* Mshl. 1908, and *bivittatus* Mshl. 1923, both differ *inter alia* in the following characters: the front margin of the submentum is not produced but deeply sinuate, leaving the mentum fully exposed; eyes flat; front tibiæ without teeth.

Subfamily *Cleoninæ.*

Lixus silvestris, sp. n.

♂♀. Derm black, with almost uniform fine grey pubescence dusted with yellowish or brownish powder; prothorax with a lateral whitish stripe which is broadest in middle, narrowing to base and apex and enclosing usually two larger and some smaller bare granules; elytra without any pattern, but usually with an elongate whitish mark about the middle of the lateral margin.

Head opaque, finely shagreened, without distinct punctures on the vertex, with a depression immediately adjoining the eye, the area behind it with strong oblique striation. *Rostrum* of ♂ stout (broader than a front femur), cylindrical, only slightly curved, the dorsal outline continuous with that of the forehead, with a very shallow oblique impression on each side at the base, finely and closely punctate dorsally, the punctures stronger and more or less confluent laterally in front of the eye; rostrum of ♀ less stout, the dorsal outline flattened or feebly sinuate in the basal half, so that the apical part appears very slightly bent at the insertion of the antennæ, the lateral punctures finer and not confluent. *Antennæ* with joint 2 of the funicle longer than 1. *Prothorax* transverse (7 : 10), widest at the base, narrowing with a slight curve to the deep collar-like apical constriction, the post-ocular lobes short and broadly rounded, the base deeply bisinuate; dorsum obliquely and more or less rugosely striolate on each side, the intervals broken into numerous small granules especially on the sides and basal half, with a very fine median carina (often obsolete) running into the deep antescutellar impression and a very shallow sublateral depression on each side behind the middle; the pubescence underlying the lateral white stripe very short, shorter than the postocular vibrissæ. *Elytra* much broader at the obtusely prominent shoulders than the prothorax, with a very slight basal constriction, the usual basal depressions distinct, the suture gibbous near the base, the subapical depression deep; the very shallow striæ with fine isolated punctures, the intervals flat, with very fine dense punctulation, becoming transversely rugulose at the base, the elevation at the base of interval 3 prominent and granular. *Legs* with fairly dense pubescence, posterior pairs of femora with a denser band; front femora with a fairly strong tooth, that on the posterior pairs rudimentary.

Length 15·0–18·5 mm., breadth 5·0–7·0 mm.

UGANDA: Mbale-Kumi Road, S. of Lake Salisbury, 3700 ft., 1 ♀, viii. 1911 (*Dr. S. A. Neave*); Koki Country, S.W. Buddu, 1 ♂, x. 1911 (*S. A. N.*); Entebbe 3 ♂♂, 4 ♀♀, x. 1911, ii.–vi. 1912, i. 1913 (*C. C. Gowdey, Dr. C. A. Wiggins*); N. of Lake Isolt, 3700 ft., 3 ♂♂ vi. 1912 (*S. A. N.*—type); Toro, Kijima, 1 ♀, on tea, ix. 1935 (*H. Hargreaves*).

KENYA: Yala R., S. edge of Kakumga Forest, 4800–5300 ft., 1 ♂, 5 ♀♀, v. 1911 (*S. A. N.*); Maramas dist., Ilala, 14 miles E. of Mumias, 3 ♂♂, v. 1911 (*S. A. N.*); Kitale, 1 ♀, vii. 1932 (*Dr. V. G. L. van Someren*).

The nearest ally to this species is *L. camerunus* Klb., which has the elytra distinctly narrower at the shoulders, these being much more oblique; the pubescence underlying the lateral stripe on the prothorax is much longer, being longer than the postocular vibrissæ; there is no sulcus adjoining the hind margin of the eye; the front tibiæ are more curved; and the dorsal outline of the rostrum in the ♀ forms a continuous curve with the forehead.

Subfamily *APIONINÆ*.

Apion taylori, sp. n.

♂♀. Derm uniformly testaceous, with markings formed of narrow white scales; prothorax with sparse setiform white scales and two indefinite discal stripes formed by slightly broader and denser scales; elytra with similar white scales on the intervals, but the basal half of intervals 1–4 with pale yellow setæ, except for an oblong postscutellar patch of white scales on 1–3; underside of ♂ with narrow white scales which are broader and much denser at the sides of the sternum and venter; in ♀ most of the scales in the middle of the metasternum and venter become setiform.

Head nearly as long as broad, finely shagreened, with sparse white scales above and a fringe of scales below the eyes in both sexes, the scales beneath being much denser in ♂ and forming an erect fringe across the gula; eyes not very convex, projecting only slightly beyond the temples. *Rostrum* of ♂ as long as head and pronotum, gently curved, very gradually narrowing from base to apex, with shallow confluent punctation and sparse setiform scales from base to three-fourths; rostrum of ♀ nearly half as long again, with sparse scales only as far as the antennæ, the apical portion with fine shallow punctation and a smooth median line. *Antennæ* pale testaceous, inserted in ♂ at a distance from the base less than the length of an eye, the distal joints of the funicle moniliform; antennæ of ♀ much longer and more slender, inserted further from the base than the length of an eye, the distal joints longer than broad. *Prothorax* about as long as broad, with the sides gently rounded in the middle, sinuate near the apex and more shallowly at the base, widest behind the middle; dorsum convex longitudinally, highest a little behind the middle, shagreened, with isolated squamigerous punctures and a deep elongate fovea near the base. *Scutellum* ovate, shagreened, bare. *Elytra* ovate, obtusely rounded at the shoulders, with the humoral callus distinct, gently rounded laterally, widest at the middle; dorsum not very convex longitudinally, highest at the middle, the broad deep striæ containing deep separated punctures and a row of setæ which are short, yellow and inconspicuous on the disk and longer and white elsewhere, striæ 1 and 2 not deeper at the apex; intervals not wider than the striæ, rugulose, with two or three irregular rows of scales or setæ. *Legs* pale testaceous, with sparse white setæ, the claws black; hind femora not reaching the apex of the elytra; no sexual dimorphism.

Length 2·0–2·2 mm., breadth 1·0–1·1 mm.

UGANDA: Hoima Road, 2 ♂♂, 4 ♀♀, viii. 1935 (*T. H. C. Taylor*).

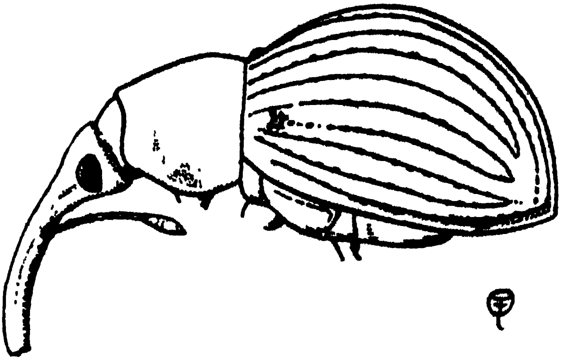
Most nearly allied to *A. rufotestaceum* Wagn., which is red-brown with the suture of the elytra, and usually the lower surface, blackish; the rostrum is straighter and the forehead distinctly striolate; the intervals on the elytra are broader than the much shallower striæ and more convex.

Piezotrachelus abutilonis, sp. n. (Fig. 2.)

♂♀. Black, moderately shiny, bare.

Head nearly twice as broad as long, shagreened dorsally, coarsely rugulose laterally and beneath; forehead flat, without furrows; eyes not projecting laterally beyond the very short temples (cf. *fronto* Wagn., Mem. Soc. Ent. Belg. xvi. 1908, pl vi. f. 5). *Rostrum* shorter than the head and pronotum, stout, moderately curved, parallel-sided from the base to the antennæ (this space being greater than the length of an eye), then very slightly and gradually narrowed to the apex, rather coarsely punctate throughout except for a broad impunctate median area on the basal half, with a shallow lateral sulcus from the eye to the antenna; rostrum of ♀ as long as the head and pronotum, much more slender, with finer punctures, the lateral sulcus obsolete. *Antennæ* piceous, with the scape a little longer than joint 1 of the funicle, which is about as long as 2 + 3 but much thicker, 5–7 about as long as broad. *Prothorax* as long as broad, widest at the base and narrowing anteriorly, with a rather deep constriction near the apex, which is broader than the head, truncate at the base; dorsum rather strongly convex longitudinally, highest behind the middle, shagreened, with rather coarse shallow punctures on the apical third and with very fine sparse ones behind, the sub-basal median fovea round and deep, the apical area behind the eyes not striolate. *Scutellum* ovate, rugulose, somewhat elevated in ♀, but not in ♂. *Elytra* ovate, broader in ♀, wider at the shoulders than the prothorax, the humeral callus more prominent in ♀ than in ♂, rounded laterally, widest at the middle; dorsum

Fig. 2.



Piezotrachelus abutilonis, sp. n., ♀.

rather strongly convex longitudinally, with deep striæ containing shallow catenulate punctures, the intervals slightly convex, 2–3 times as wide as the striæ. *Legs* rather short and stout, the tarsal claws with a small basal tooth.

Length 1·5–1·6 mm., breadth 0·7 mm.

UGANDA: Kampala, 2 ♂♂, 5 ♀♀, in seed-capsules of *Abutilon indicum*, iii. 1928 (*H. Hargreaves*).

Most nearly allied to *P. fronto* Wagn., of which only the ♀ is known, the two original specimens being before me. They differ from the new species in having the rostrum rather shorter and more curved; the prothorax is narrower and longer than broad, the sub-basal fovea is shallower and more distant from the base and there is a second shallower fovea in front of it beyond the middle, the two being joined by a very faint stria, and the apical area behind the eyes is strongly obliquely striolate; the elytra are broader at the shoulders, with the callus more evident; the two basal joints of the tarsi are not equal (as Wagner says), the first being the longer, though it is notably shorter than in allied species; the scutellum not elevated.

Subfamily *CRYPTORRHYNCHINÆ.*

Mecistocerus lineicollis, sp. n.

♂♀. Derm black, with dense light brown and blackish scaling; prothorax with dense light brown scaling beneath, the dorsum black, with a conspicuous complete pale median line, a small indefinite pale spot close on each side of it at the middle, and a very indefinite sublateral brown stripe (sometimes obsolescent); elytra light brown with a black spot at the base of intervals 4 and 5 and another on 2 and 3 at one-third from the base, a rather oblique broad macular black band at about the middle extending from stria 1 to the lateral margin, and some irregular black markings on the posterior declivity; underside with uniform light brown scaling, but ventrites 3 and 4 bare except at the margins.

Head with the vertex bare and strongly reticulately punctate, the anterior part with the punctures hidden by dense fawn scaling enclosing two large ovate dark patches; frontal fovea deep, elongate. *Rostrum* strongly punctate and tricarinate from the base to the antennæ in ♂, the punctures and carina restricted to the base in ♀. *Antennæ* inserted at (♂) or behind (♀) the middle of the rostrum, red-brown; funicle densely pubescent, joint 2 much longer than 1, the rest becoming progressively shorter, all longer than broad. *Prothorax* as long as broad, subconical, gently rounded laterally, widest at the distinctly bisinuate base, shallowly constricted at the apex; dorsum almost flat longitudinally, with very deep large close punctures and no median carina. *Scutellum* slightly transverse, trapezoidal, convex, bare. *Elytra* ovate, distinctly wider at the shoulders than the prothorax, trisinuate at the base with the basal angles projecting slightly forwards, produced downwards at the apex, with a deep lateral subapical constriction and prominent obtuse posterior calli; the shallow striæ with very deep separated punctures which are not obscured by scaling, the intervals broader than the punctures and with a row of short peg-like subrecumbent setæ. *Legs* rather slender, with dense fawn scaling, femora with a dark submedian dorsal patch, tibiæ with a blackish band near the base; tooth on front femora very small and obtuse, that on hind pair larger, sharp and triangular; tibiæ not narrowing from the middle to the apex, hind pair sinuate basally beneath.

Length 9·2–11·0 mm., breadth 4–5 mm.

UGANDA: Mabira, 1 ♀, iii. 1913 (*C. C. Gowdey*); Entebbe, 6 ♂♂, 1 ♀, iii.–iv. 1914 (*C. C. G.*—type).

Most nearly allied to *M. apicalis* Fst. (1898), from Cameroons, which is quite similar in general facies but has the prothorax transverse and more abruptly narrowed at the apex, with much smaller and more distant punctures; the elytra also have a conspicuous heart-shaped pale patch at the apex, its anterior margin being separately arcuate on each elytron.

Subfamily ZYGOPINÆ.

Mecopus carpenteri, sp. n.

♂♀. Derm black, with rather dense scaling; prothorax with brown scales dorsally, turning to grey on the pleuræ, and the following ochreous markings: a transverse subelliptical patch lying in the apical depression, and a basal band which is produced forwards into three broad stripes (median and sublateral), the middle one being usually paler; scutellum conspicuously white; elytra with brown scaling, variegated laterally with rows of single grey scales, the basal margin very indefinitely ochreous, and with sub-basal, median and subapical common ill-defined ochreous bands which are deepest at the suture and more or less narrowed to stria 4; sternum with dense broad whitish or yellowish-white scales, except for a large subquadrate patch of dark brown on the basal half of the metepisterna (reduced in one ♀ to a narrow basal band), the scales in the middle of the metasternum much narrower and sharply acuminate; venter with scaling like the sternum, but in ♂ there is a large bare patch in the middle of ventrites 1 and 5, whereas in ♀ the scales in the middle of ventrites 1 and 2 are only somewhat smaller than the lateral ones and hardly contiguous.

Rostrum of ♂ shorter than a front tibia, moderately curved, gradually narrowing from base to antennæ (at about one-fourth from apex), thence widening rapidly to the apex, opaque, reticulately punctate, with an impunctate median line on the apical part and a narrow undulant lateral carina on the posterior part; rostrum of ♀ only two-thirds as long, rather more strongly curved, with the antennæ at one-third from apex. *Antennæ* red-brown to blackish; funicle with the two basal joints elongate and equal, 3-6 subequal and longer than broad, 7 as long as the three preceding joints. *Prothorax* transverse (5 : 7), parallel-sided for about four-fifths from base, then very abruptly and deeply constricted at apex in ♂ (not quite so deeply as in *talanthoides* Hllr.), much less strongly constricted in ♀, the constriction continued broadly across the dorsum, which is convex longitudinally and highest behind the middle, the punctures concealed by the dense scaling. *Scutellum* oblong, longer than broad. *Elytra* subtriangular, not wider than the prothorax, separately rounded at the apex, each with a very short sutural mucro, with a shallow transverse depression on each side of the base and a common subquadrate post-scutellar one; the punctures in the striæ distinct laterally but almost concealed by scaling on the disk; interval 1 somewhat elevated and closely denticulate on the posterior half, interval 3 with three to five backwardly-directed spine-like setigerous tubercles on the posterior half and 5 with three or four similar ones, the remaining intervals with a spaced row of very small flat granules bearing a broad grey scale. *Legs* shallowly reticulate, rather thinly clothed with setiform white scales, which are denser on the dorsal edge of the hind tibiæ and especially on the upper surface of the hind tarsi ; femoral tooth small and spine-like ; middle tibiæ of ♂ not exceeding the apex of the elytra and the front tarsi with a fringe of long curled hairs. *Sternum* with the prosternal spines of ♂ reduced to small shiny tubercles.

Length 5·5–7·0 mm., breadth 2·0–2·6 mm.

UGANDA : W. Busoga, 5 ♂♂, 5 ♀♀, iv. 1926 (*Dr. G. D. H. Carpenter*—type) ; Jinja, 4 ♂♂, 6 ♀♀, xii. 1928, x. 1930, vii. 1931 (*Dr. V. G. L. van Someren*).

This species may be recognised from all its African congeners by the transverse ochreous band near the front margin of its pronotum. In general facies and in the pattern of the elytra the nearest ally is *talanthoides* Hllr., the ♂ of which can be distinguished by its elongate middle femora, and by the complete absence of any tubercles on the prosternum and of the fringe on the front tarsi ; while the ♀ differs in the extensive black markings on the underside and the absence of the row of grey scales on the lateral intervals of the elytra.

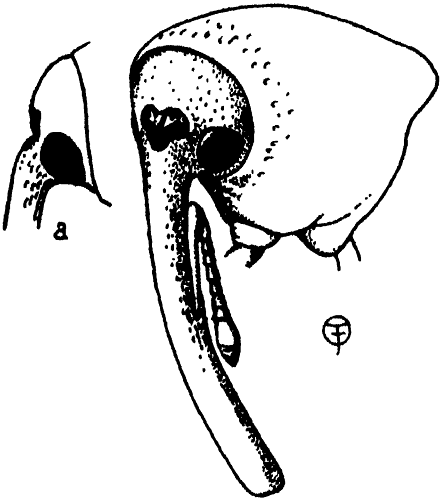
Subfamily *BARIDINÆ*.

Baris caviceps, sp. n. (Fig. 3.)

♂♀. Derm red-brown, bare, opaque, pronotum and sternum often darker and sometimes also the sutural area of elytra.

Head shagreened, with small shallow punctures, the forehead with a large deep subcordiform excavation. *Rostrum* of ♂ rather stout, longer than the pronotum (11 : 8), strongly and regularly curved, compressed laterally in the basal half, narrowing somewhat dorso-ventrally from the antennæ to the apex, opaque, with very shallow coarse confluent punctures throughout, without any carinæ or setæ, and with a small tooth on each side of the apex on the underside ; rostrum of ♀ a little longer, more slender, no deeper dorso-ventrally near the base than in the apical half, rather shiny dorsally and with very fine scattered punctures, without any apical teeth. *Antennæ* inserted beyond the middle of the rostrum in ♂ and a little behind it in ♀, red-brown; funicle with joint 1 as long as 2+3+4, 5–7 transverse, widening distally, 7 distinct from the club. *Prothorax* of ♂ widest behind the middle, rather rapidly narrowed at five-eighths from base to the collar-like apical constriction, this narrowing much less abrupt in ♀; dorsum slightly convex longitudinally, highest at a little beyond the middle, shagreened, with strong close punctures, which are subconfluent in oblique curved lines, with a narrow impunctate median line; the punctures on the pleuræ larger and deeper. *Scutellum* small, transverse, with a shallow median impression. *Elytra* narrowly ovate, only slightly wider than the prothorax, with the shoulders obliquely rounded, parallel-sided to one-third from the base, markedly dehiscent and separately rounded at the apex, with a very shallow transverse depression at the base of each elytron, the posterior calli obsolescent; the deep narrow striæ containing small separated punctures, both becoming wider towards the base; the intervals broad, flat, finely shagreened, with

Fig. 3.



Baris caviceps, sp. n., ♀.

a single row of large shallow transverse punctures which rapidly become obsolescent posteriorly, intervals 3 and 9 uniting to form a short raised costa at the apex. *Legs* red-brown, with coarse shallow subconfluent punctures, without any scales or setæ; tarsal claws very small, closely approximated. *Sternum* with a shallow median furrow on the front part of the prosternum.

Length 3·0–3·5 mm., breadth 1·3–1·4 mm.

UGANDA: Kampala, 5 ♂♂, 1 ♀, on leaves of *Impatiens*, viii. 1933 (*H. Hargreaves*—type); Western Ankole, 4500–5000 ft., 1 ♂, x. 1911 (*Dr. S. A. Neave*).

This species can be easily recognised by the deep excavation on the forehead.

Athesapeuta varicolor, sp. n.

♂♀. Derm black, except the elytra which are red-brown with a black sutural stripe that extends only to stria 1 near the base, but widens behind to stria 2 or 3; prothorax with a broad bare lanceolate median stripe, the lateral areas with dense orange scaling containing a bare spot of variable size and shape; elytra with dense orange to pale yellow scaling forming stripes on intervals 3 and 5 and the lateral margins as far as stria 8, and also covering the bases of intervals 2, 4 and 6; these scales are rather easily abraded and it is probable that they sometimes cover the whole surface; underside with dense orange to yellow scales laterally, the propleuræ with a bare black patch, the median area of the metasternum and venter with much smaller isolated scales. In many individuals the upper surface is entirely devoid of scales, the underside being clothed throughout with small isolated whitish scales; these are again divided into two forms: (*a*) with the elytra red-brown with a black sutural stripe (just as in the typical form), and (*b*) with the elytra entirely black.

Head opaque, bare, with minute isolated punctures, separated from the rostrum by a deep incision. *Rostrum* of ♂ a little longer than the pronotum (6 : 5), strongly and regularly curved, cylindrical from the base to the antennæ, which are inserted at one-third from the apex in both sexes, somewhat widened and flattened at the apex, not compressed at the base, bare, with sparse minute punctures dorsally and strong dense punctures laterally, with a few scales in front of the eyes; rostrum of ♀ very similar, but rather more slender, much narrower dorso-ventrally in the apical part, and with the punctures almost obsolete. *Antennæ* black; funicle with stiff yellow setæ, which are dense on joint 1, widening distally, joints 5–7 transverse. *Prothorax* transverse (4 : 5), widest at the base, gradually narrowing to the middle with the sides straight, then curving inwards to the broad apical constriction, the base shallowly bisinuate, twice as broad as the apex; dorsum with small punctures which are separated by at least their own diameter on the disk, but much denser laterally, with a smooth median line which is broad on the basal half and much narrower in front; the pleuræ with much larger punctures. *Scutellum* transverse, bare, shiny, impunctate. *Elytra* elongate, a little wider at the shoulders than the prothorax, parallel-sided to beyond the middle, jointly subtruncate at the apex; the striæ deep, with very shallow spaced punctures, the intervals broad, punctate, the punctures being more numerous on intervals 3 and 5. *Legs* with dense orange or yellow scales; posterior pairs of femora in ♂ with a dense fringe of long suberect setæ; tibiæ of ♀ with a short sharp subapical tooth near the mucro, tibiæ of ♂ without this tooth, but the front pair with a long sharp oblique tooth at about the middle.

Length 5·5–7·0 mm., breadth 2·0–2·8 mm.

UGANDA: Madi, 13 ♂♂, 7 ♀♀, v. 1927 (*Dr. G. D. H. Carpenter*).

Of this series 4 ♂♂ and 1 ♀ have the same dermal colouring as the typical form, but without any of the broad orange or yellow scales; this can hardly be due to mere abrasion, because at the base of the pronotum and at the base and apex of the elytra there are some narrow whitish scales of a different type, while on the lower surface every puncture contains a small narrow isolated whitish scale, quite unlike the clothing of the typical form. This form may be known as var. *subcalva*, nov.

Another form (3 ♂♂, 1 ♀) resembles var. *subcalva* except that the elytra are entirely black, though the apical and part of the lateral margins may be reddish (var. *atronuda*, nov.).

Dr. Carpenter took one pair *in copula*, of which the male was of the typical squamose form and the female was an *atronuda*. The difference in the scaling may possibly be due to the failure of the scales to develop, though the insects are fully mature in all other respects; and this further suggests that the species may be in process of losing its scales.

The nearest ally is *Titanobasis semirubra* Hust., from Angola, which must be transferred to the genus *Athesapeuta*. It is a much narrower insect, with the elytra not wider than the prothorax and the apices separately rounded, the pygidium being much more prominent; and the front tibiæ of the male bear two teeth instead of one.

III.—*A few new Species of the Genus* Onthophagus (*Coleoptera*, Copridæ) *from New Guinea and Japen Island.* By Gilbert J. Arrow, British Museum (Natural History).

The insects here described were taken by Miss L. E. Cheesman during her collecting expeditions in 1933–4 and 1938–9.

The great genus *Onthophagus* is almost world-wide, although generally absent from oceanic islands. With the exception of a single Australian species found in New Zealand, and two doubtful or perhaps introduced species recorded from Tahiti and Woodlark Island, New Guinea and Australia form the limit of its range eastwards. In Australia the species are numerous, but few had been found in New Guinea until recent years. Fifty-three were enumerated by Gillet in 1930 (Nova Guinea, vol. xv.), nearly half of which were previously unknown. A few are common to Australia and New Guinea. Only one species has been hitherto known from Japen Island (usually, but incorrectly, called Jobi I.), but two others are here described.

Four or five of the new forms belong to the *papuensis* group, which is very characteristic of the Papuan fauna. Several of its members were found by Miss Cheesman in large numbers. The males have the middle of the clypeal margin produced into a reflexed process, and a horizontal thoracic process, springing from the middle of the pronotum, is either present or represented by a transverse ridge, except in *O. bufulus*. *O. platalea* shows both processes at their highest development. *O. minotaurus*, which I have also included in this group in the accompanying tabulation, is perhaps not really a member of it. The male has a process arising from the clypeal margin and a pair of dorsal processes, but the clypeal process seems to have actually been formed from the ridge representing the frontal suture. This, by a very remarkable adjustment, has been pushed forward, so that in the middle it meets the clypeal margin. In *O. mayeri* Har., one of the three species found by Miss Cheesman in Japen Island, the frontal carina, which also bears a median process, has moved forward in the same way but without reaching the clypeal margin.

Papuan species of this enormous genus, now numbering nearly sixty, will no doubt eventually prove to be much more numerous.

The following key will assist in the identification of the new species belonging to the *papuensis* group :—

1 (14).	Upper surface not rugose.	
2 (5).	Upper surface entirely shining.	
3 (4).	Head and thorax bright coppery-red (♂, head and thorax with long horns). .	*platalea*, sp. n.
4 (3).	Entirely black (♂, head with short process).	*papuensis* Har.
5 (2).	Upper surface not entirely shining.	
6 (9).	Pronotum densely punctured.	
7 (8).	Elytra densely punctured (♂, clypeal process and front tibia very broad). . . .	*latenasutus*, sp. n.
8 (7).	Elytra not densely punctured (♂, pronotum bituberculate in front)	*bufulus*, sp. n.
9 (6).	Pronotum not densely punctured.	
10 (11).	Elytral striæ strongly punctured (♂, clypeal process not broad)	*parryi* Har.
11 (10).	Elytral striæ very finely punctured.	
12 (13).	Sides of the pronotum not pale-margined (♂, front tibia slender)	*cheesmanæ*, sp. n.
13 (12).	Sides of the pronotum pale-margined (♂, thorax with horizontal process) . . .	*signifer* Har.
14 (1).	Upper surface coarsely rugose (♂, thorax with two horizontal processes)	*minotaurus*, sp. n.

Onthophagus platalea, sp. n.

Læte metallico-fulgens, elytris rufo-brunneis exceptis, capite et pronoto igneo-cupreis, corpore subtus cum pedibus cupreo-viridibus ; ovalis, modice convexus, capite lævissimo, haud carinato, lateribus rotundatis, clypeo producto ; pronoto lævi, vix perspicue punctato, marginibus rotundatis angulis anticis obtusis ; elytris lævibus, striis distincte sat remote punctatis, intervallis vix convexis, parce et minute punctatis; pygidio minute sat parce punctato, corpore subtus lævi, lateribus flavosetosis;

♂, capite antice cornu gracili arcuato pronotoque cornu horizontali longo armatis; tibia antica modice elongata.

Long. (cornubus exceptis) 7 mm.; lat. max. 4·5 mm.

N.W. NEW GUINEA: Japen I., 3 miles from mouth of R. Manai-Undei, 500 ft. (*Miss L. E. Cheesman*, October).

I have seen only a single male of this beautiful species. It is a notable exception to the generally observed principle in horned beetles that the degree of development of the horns depends upon the size of the insect. Although not larger than its nearest known allies, it bears slender horns of remarkable length upon both head and thorax. It is smaller than *O. nasicus* Gillet, to which it is evidently related, and which is almost black and not shining. The surface of *O. platalea* is extremely smooth and shining, the head and pronotum fiery red or golden-green, and the elytra chestnut-brown. The head is not very broad, rounded at the sides, almost entirely smooth and without sutures or ridges. The pronotum, like the head, is almost smooth, the punctures very scanty and minute, although a little more distinct at the sides. The front angles are very blunt and the base gently rounded. The elytral intervals are almost smooth, and the striæ contain not very numerous but rather distinct punctures. The pygidium is scantily and unevenly punctured.

The front margin of the clypeus of the male bears a long slender horn, curving upward and forward, and gradually widening a little towards the end. The pronotum also bears a slender process extending horizontally from above and behind the front margin and slightly dilated at the end. The front tibia is curved, a little elongated and armed with four sharp external teeth.

Onthophagus latenasutus, sp. n.

Niger, subnitidus, capite, corpore subtus pedibusque rufopiceis, pronoto et elytris crebre minutissime setosis, setis erectis pallidis; late ovalis, convexus, pronoto et elytris crebre sat minute punctatis, pronoti lateribus regulariter arcuatis, angulis anticis obtusis; elytris leviter striatis, intervallis planis, setosis; pygidio setoso; pedibus robustis; ♂, capite nitido, lato, lateribus paulo reflexis, rotundatis, clypeo antice late lobato, reflexo, pronoti dimidio

antico medio excavato vel planato, excavationis margine postico medio subdentato ;

♀, capite crebre punctato, antice attenuato, acute bidentato.

Long. 6·5–10 mm. ; lat. max. 4–5 mm.

EASTERN NEW GUINEA : Kokoda, 1200 ft. (*Miss L. E. Cheesman*, September), Sattelberg.

Numerous specimens of this species were taken. It is closely related to *O. papuensis* and *parryi* of Harold, and of almost the same size. It differs from both in its close puncturation and the numerous, though not conspicuous, minute scales clothing the pronotum and elytra. The elytral striæ are indicated by denuded bands between the setæ.

In the male the erect clypeal process is much broader than in the other species of this group, and the front tibiæ are not elongate but broader than those of the female, with short and very sharp teeth. The anterior part of the pronotum, except in dwarfed specimens, is flattened or slightly hollowed, and the hind margin of this area bears a small tooth in the middle.

Onthophagus bufulus, sp. n.

Niger, capite, corpore subtus pedibusque rufescentibus, capite nitido, antice vix, postice fortiter punctato, pronoto et elytris opacis, illo crebre æqualiter sat fortiter punctato, elytris minutissime coriaceis, lævissime striatis, striis minute punctatis ;

♂, capite lato, haud carinato, clypeo antice angustato, marginis antici medio sat longe producto, reflexo ; pronoto pone marginem anticum bituberculato, tuberculis sat approximatis ; tibiis anticis modice elongatis, extus quadridentatis.

Long. 5 mm. ; lat. max. 3·5 mm.

EASTERN NEW GUINEA : Mafulu, 4000 ft. (*Miss L. E. Cheesman*, January).

I have seen only a single male specimen. It is of similar size and shape to *O. cheesmanæ*, but slightly larger, with darker legs, and entirely dull black above, with the exception of the head, which is shining but rather more strongly punctured upon the posterior part than in other males of the group. It is broader behind than that of *O. cheesmanæ* and the front margin is produced upwards abruptly as a nasal horn longer than the similar process in the males of *O. cheesmanæ* and *latenasutus*.

In the type-specimen it is about twice as long as it is wide. The pronotum is closely punctured and without the flattened anterior area found in other males of this group, or the ridge limiting the area behind. This is represented in *O. bufulus* only by a pair of small tubercles a little above and behind the anterior margin and not far apart. The elytra are microscopically coriaceous, with very fine and feebly-impressed striæ bearing minute widely-spaced punctures. The front tibiæ of the male are rather slender.

The female will no doubt be found to have the clypeus bidentate, as in the related species.

Onthophagus cheesmanæ, sp. n.

Niger, parum nitidus, elytrorum basi et apice plerumque minute ferrugineo-maculatis, pedibus rufo-brunneis femoribusque 4 posterioribus flavis; breviter ovatus, modice convexus, capite et pronoto nitidis, æqualiter haud crebre punctatis, capite plano, haud carinato; elytris opacis, leviter striatis, striis parce punctatis, interstitiis vix convexis, parce et minute punctatis; pygidio sicut abdomine flavo-variegato, opaco, minute et sparse setuloso; tibiis anticis 4-dentatis;

♂, capite antice producto, breviter haud late recurvato-cornuto, pronoto convexo, haud antice deplanato, carina brevi transversa, subtiliter arcuata, pone marginem anticum instructa, tibia antica elongata;

♀, capite antice producto, acute bidentato.

Long. 4·5–5 mm.; lat. max. 3 mm.

Eastern New Guinea: Kokoda, 1300 ft. (*Miss L. E. Cheesman*, September).

Fairly numerous specimens of this species were found. It is black, with pale legs, the middle and hind femora very pale yellow, and the elytra decorated with minute yellow spots near the bases of the 2nd and 4th and the extremities of the 2nd, 4th and 6th intervals. The spots are sometimes wanting. The pygidium and abdomen are also yellow-spotted. It is a rather short and broad insect, the head and pronotum are shining and evenly but not closely punctured, the elytra dull, with minute scattered punctures on the intervals, and distinct but fine and rather sparse punctures in the striæ.

In the male the clypeal margin is produced as a short but not broad recurved process. The pronotum has neither process nor dorsal flattening, but there is a short transverse ridge just behind the front margin.

Onthophagus minotaurus, sp. n.

Niger, clava antennali solum fulva ; late ovalis, supra rugosus ; oculis desuper visis minutis ; pronoto medio sulcato, angulis anticis plus minusve productis ; elytris late sulcatis, striis obsoletis, intervallis convexissimis, rugosis ; pygidio rugoso ;

♂, capite elongato, postice lævi, antice punctato, lato, margine arcuato, medio cornu erecto brevi armato, angulis lateralibus acutis, recurvatis ; pronoto cornubus duobus horizontalibus parallelis supra armato, angulis anticis acute productis ; tibiis anticis elongatis ;

♀, clypeo rugoso, producto, carina frontali arcuata instructo, pronoto pone marginem anticum tuberculis 4 transverse positis armato.

Long. 13·5–14·5 mm. ; lat. max. 8·5–9·5 mm.

EASTERN NEW GUINEA : Kokoda, 1200 ft. (*Miss L. E. Cheesman*, October), Sattelberg.

Besides the male type from Kokoda, the British Museum collection contains a female from Sattelberg, received from the late Prof. Hauser. Although the structure of the head is remarkably different in the two sexes, that of the male being highly peculiar, their specific identity cannot be doubted.

The species is very aberrant in the sculpture of the elytra, of which the striæ are almost lost, although partly traceable in the broad, finely shagreened and opaque grooves, of which the intervals are very convex, slightly shining and coarsely rugose. The pronotum is also coarsely rugose and has a rather deep median groove in both sexes. The front angles are rather acute in the female, strongly produced but more blunted in the male. The clypeus of the female is produced in front but scarcely bidentate, that of the male extremely abbreviated, the frontal carina, which bears in the middle a short erect horn, being stretched forward elliptically, so that the horn rests upon the front margin, which is strongly rounded. The lateral angles formed by the junction of the clypeus and genæ are acute and curve upwards, and the head is contracted and elongate behind. The pronotum is very convex, and bears in the male a pair of horizontal horns, which are parallel and arise a little before the middle, curving slightly downwards. They are represented in the female by rudimentary processes and there are also two outer tubercles placed in line with these. The front tibiæ bear four lateral teeth, and those of the male are rather long.

Onthophagus tarsius, sp. n.

Niger, modice nitidus, pronoti lateribus perpaulo metallicis; late ovatus, convexus, oculis desuper visis permagnis, pronoto parce et minute punctato, angulis anticis vix productis; elytris subopacis, striatis, striis distincte punctatis, intervallis parce minutissime punctatis, externis convexis; pygidio sat fortiter punctato; corpore subtus sat longe fulvo-villoso;

♂, capite subrugose punctato, inter oculos utrinque minute carinato, clypeo leviter producto, margine antico paulo reflexo, vix angulato; pronoto, lateribus et basi exceptis, planato, ante basin medio breviter acute retro-producto.

Long. 14 mm.; lat. max. 8·5 mm.

N.W. New Guinea: Japen I., 3 miles from mouth of R. Manai-Undei, 500 ft. (*Miss L. E. Cheesman*, October).

Only the unique male type is known. Although practically black, except the yellow club of the antenna, there is a faint metallic reddish tinge upon the legs and the sides of the pronotum. The species is related to the North Queensland *O. desectus* Macl., and the head and thorax of the males are of similar form. The large size of the eyes, as seen from above, forms the most striking feature of *O. tarsius*. They are larger than in any other species of the genus known to me, the distance between them being only twice the long diameter of one of them. There is a small but sharp oblique elevation near the inner margin of each eye. The head is closely and rugosely punctured, the clypeus very bluntly pointed and divided by an entire carina from the forehead. The pronotum is very lightly and sparsely punctured, the front angles not very acute, as in *O. desectus*, and its whole upper surface (in the male), except the sides and base, is flattened out, forming a broadly oval area, with its posterior edge sharply carinate except in the middle, where there is a very acute spike directed obliquely backwards. The elytra are subopaque, the striæ containing distinct, not very numerous, punctures, and the intervals very minutely sparsely punctured. The pygidium is fairly strongly punctured.

The (male) front tibia is scarcely elongate, and bears four stout lateral teeth.

IV.—*New Myriopods from Formosa and Hainan Island* *.

By J. Linsley Gressitt, Lingnan University, Canton, China.

During a preliminary study of several hundred specimens of Myriopods collected by the writer in the Orient at intervals between 1929 and 1936, several species were ascertained to be new to science. Five of these, one belonging to the Chilopoda and four to the Diplopoda, are described at this time. The Chilopod is from the island of Formosa, and of the Diplopods, three are from Formosa, and one from Hainan Island, south of the Chinese mainland.

The type-specimens are to be deposited in the entomological type collection of the California Academy of Sciences in San Francisco, and the paratypes in the Lingnan Natural History Museum, Canton, China, and in the collection of the writer.

CHILOPODA.

Family **Mecistocephalidæ**.

Genus Mecistocephalus Newport.

Mecistocephalus insulomontanus, sp. n.

Slender, subparallel; body with forty-nine pairs of legs.

Body grey-brown to ochraceous, finely mottled with darker; head dark reddish-brown; antennæ reddish-brown, slightly lighter than head, with apices of segments subochraceous; legs ochraceous basally, slightly reddish towards apices; sternites dirty ochraceous, faintly mottled with darker.

Antennæ about twice as long as head-shield, or slightly longer; basal segments about as broad as long, somewhat

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* Contribution from the Lingnan Natural History Survey and Museum, Lingnan University, Canton, China.

bead-shaped; median segments narrowed; apical segments subcylindrical; basal segments distinctly hairy. Head-shield subrectangular, nearly twice as long as broad, slightly wider anteriorly than posteriorly, irregularly impressed with sparse shallow punctures, sparsely clothed with very short brownish hairs. Anterior portion of clypeus one-half again as long as posterior part, a round sclerotized spot surrounding insertion of a bristle on either side of middle of former; posterior part divided by a pale suture. Cephalic pleurite with only a few short spines posteriorly. Apical segment of second palpus cylindrical, nearly four times as long as broad, hairy. Prefemur of gnathochilarium with two short, subequal teeth internally; femur and tibia each with a small tooth. Body tergites more than twice as broad as long, fairly smooth, clothed with short hairs. Sternites likewise hairy, giving a granulose appearance; sclerotized groove on anterior sternites broadly forked at anterior end. Sternite of last leg-bearing segment semicircular, broadly rounded apically. Pores on coxæ of last pair of legs moderately numerous.

Measurements of type: length 45 mm.; breadth 2 mm.; paratype: length 40 mm.; breadth 1·6 mm.

Holotype (California Academy of Sciences), Arisan, alt. 2,000 metres, central Formosa, May 24, 1934 (*J. L. Gressitt*; paratopotype, May 23.

This centipede differs from *M. ongi* Takakuwa, of the western lowlands of Formosa, in having the head-shield narrower, less coarsely punctured, the posterior part of the clypeus relatively longer, the sternite of the last leg-bearing segment shorter and less narrowed apically, and the last pair of coxæ broader and with more pores.

DIPLOPODA.

Family **Sphærotheridæ**.

Genus ZEPHRONIA Gray.

Zephronia hainana, sp. n.

Broad, rounded anteriorly and posteriorly; tergites strongly arched and smooth; capable of rolling into a sphere.

Colour dull chestnut-brown to blackish-brown; tergites mostly reddish-brown anteriorly on portions exposed when body is coiled, dark brown or blackish-brown posteriorly; head and cervical tergite nearly black; antennæ pale at base and apex of each segment except last, remainder blackish-brown; anal tergite reddish-brown near apical margin; ventral surfaces and legs dirty testaceous-brown.

Antennæ and front of head rather densely clothed with fairly short brownish hairs, longer on head; cervical tergite sparsely clothed with very fine hairs; following tergites practically glabrous except for depressed areas on antero-lateral portions; legs moderately hairy.

Head vertical in front, twice as broad as long, narrowed and subtruncate anteriorly; anterior margin with a small emargination with a small tooth at centre; latter not projecting beyond rest of margin; surface feebly vermiculate-rugulose, shallowly grooved medially towards apex; eyes rounded, placed at lateral angles, composed of sixty or more ocelli. Antennæ six-segmented; first five segments broader than long, each widest at middle, narrowed towards base and apex; apical segment nearly twice as long as broad, bluntly rounded apically. Cervical tergite small, elliptical, acute at either side, feebly convex at middle of anterior margin, irregularly punctured; thoracic tergite slightly longer than those immediately following, broadened, rounded and compressed along margins at sides, minutely and rather closely punctured except on parts of compressed borders and near posterior margin; following tergites shorter, subequal, slightly larger posteriorly, narrowed at sides, punctulate on anterior halves only; anal tergite large, convex, subvertical posteriorly, evenly rounded apically, smooth, nearly impunctate. Legs compressed, briefly clawed and hairy at tips. Gonopods chelate.

Measurements of type: length 33 mm.; breadth 15·5 mm.; paratypes: length 15–34 mm.; breadth 7–16 mm.

Holotype, male (California Academy of Sciences), Tai-pin-ts'uen (Dwa-bi), alt. 375 metres, foot of Loi Mother Mountain, central Hainan Island, south of China (lat. 19° N., long. 109° 40′ E.), July 23, 1935 (*J. L. Gressitt*);

paratopotypes of both sexes, July 20–23 ; two paratypes from Nodoa, alt. 275 metres, north central Hainan Island, June 2 and July 14 ; two paratypes from Nam-fung, alt. 260 metres, south of Nodoa, July 16, 1935 (*J. L. Gressitt*) ; one paratype, Fan-heang, alt. 500 metres, central Hainan, March 26, 1936, taken for me by my native collector.

Differs from *Z. siamensis* Hirst [1907, Ann. & Mag. Nat. Hist. (7) xx. p. 218, pl. 10, figs. 4, 14–16 : Siam] in being brown instead of green, in lacking the yellow spots, in having the lateral depressed stripe of first tergite widened below, the body-size larger, and the tergites nearly glabrous and only partially punctured. Differs from *Z. dollfusi* Pocock [1895, Ann. & Mag. Nat. Hist. (6) xvi. p. 413 : Cochin-China] in being brown instead of olivaceous, in having the tergites only partially punctured, the lamina of second tergite distinct, and the inner crest of anal segment not represented by a black tubercle.

The individuals of this "pill-millipede" were found roaming on the leaf-mould on the floors of the damp jungles in deep shade. Their locomotion is slow, but more rapid than that of most millipedes.

Family **Strongylosomidæ**.

Genus ORTHOMORPHA Bollmann.

Orthomorpha flavomarginata, sp. n.

Shiny black ; lateral swellings and apical half of caudal tergite pale yellowish ; antennæ black ; legs rufo-piceous, lighter reddish-brown on tarsi ; sternites light reddish-brown in middle, dark pitchy-red at anterior and posterior margins ; pleurites pitchy-black below lateral carinæ, becoming pitchy red-brown towards sternites.

Head evenly convex, impressed by a fine, shallow groove from middle of vertex to post-occiput ; surface smooth, sparsely and minutely punctulate and clothed with very short, sparsely placed hairs on genæ, labrum, and apical portion of clypeus, Antennæ slender, hairy ; segments only slightly thickened apically ; second to fifth segments nearly equal in length and diameter ; sixth four-fifths as long as fifth, more cylindrical ; seventh very short. Tergites smooth, practically impunctate, briefly expanded laterally, the expansions rounded anteriorly, subangulate posteriorly, deeper than wide at anterior ends on fifth and following segments, the upper and lower borders evenly converging posteriorly; lateral margin of first tergite distinct, rounded; that of second prominent, straight, longer, and at a lower level than those of first, third, and fourth segments; fifth and following tergites faintly grooved transversely near their transverse axes. Legs slender, hairy; femur as long as tibia and metatarsus combined.

Length 24 mm.; breadth 4 mm.

Holotype (California Academy of Sciences), Hori (Horisha), alt. 550 metres, central Formosa, May 5, 1934 (*J. L. Gressitt*).

Differs from *O. naderi* (Brölemann) in having the tergites smoother, the antennæ and legs darker, the lateral carinæ narrower, deeper, and less acute posterolaterally.

Genus PRIONOPELTIS Pocock.

Prionopeltis piceofasciatus, sp. n.

Moderately broad, slightly narrowed anteriorly; feebly convex, fairly smooth.

Body ochraceous-brown; anterior portions of disks of tergites pitchy red-brown; antennæ pale ochraceous, pitchy-black on apical half of sixth segment and on basal half of seventh; head pale, with a pitchy spot at centre of vertex; legs pale ochraceous; sternites pale testaceous; pleurites brownish-testaceous.

Head small, smooth, feebly grooved on occiput, glabrous except on lower parts of sides and front. Antennæ slender, reaching to about posterior margin of fourth tergite; each segment gradually thickened towards apex; second to sixth segments subequal in length. Tergites fairly smooth, only slightly convex, feebly impressed along transverse axes of disks, broadly expanded at sides, giving tergites the form of a transverse oblong, about four times as broad as long; antero-lateral corners less angulate than posterior corners; last tergite strongly narrowed at middle, narrowly emarginate-truncate apically. Length of type 44 mm.; breadth 5·7 mm.

Holotype (California Academy of Sciences), Arisan, alt. 2000 metres, central Formosa, May 24, 1934 (*J. L. Gressitt*); paratype, same data.

Family **Fontariidæ.**

Genus Rhysodesmus Cook.

Rhysodesmus ochraceus, sp. n.

Large, broad, subparallel-sided; segments convex, smooth.

Reddish-ochraceous above, with lateral expansions of tergites paler, yellowish-testaceous and subhyaline; head reddish-ochraceous, paler at middle of vertex, finely streaked with piceous on occiput and frons, darker towards apex of clypeus; disks of tergites with dark fine mottling on anterior portion of body; tinged with olive-brown towards posterior end of body; antennæ, legs, and sternites pale ochraceous, nearly testaceous, subhyaline; pleurites ochraceous or testaceous anteriorly, tinged with olive on posterior portion of body.

Head evenly convex, smooth, impunctate, slightly depressed in centre of vertex, feebly grooved along mid-line of occiput from depression on vertex; surface practically glabrous, a few hairs on labrum and apex of clypeus. Antennæ a little shorter than legs, moderately hairy; segments slightly and gradually thickened towards apices; first segment short; second not quite as long as third; third to fifth subequal in length; sixth a little longer than fifth; seventh minute. First tergite smooth, but not highly polished, nearly twice as long as second, narrowed and subacutely angulate at middle of each side. Following tergites moderately smooth above, finely granulose laterally; expanded margins of posterior segments smooth. Lateral carinæ broadly expanded, subrectangular on anterior segments; those towards posterior end of body rounded at anterior corners and subangulately produced posteriorly. Preanal segment triangular, narrowly truncate at apex, bearing eight tawny bristles. Legs stout, moderately hairy. Gonopods short, stout, arched and hairy; each ending in two irregularly sinuate, dissimilar, recurved, slender processes.

Length 50 mm.; breadth 9 mm.

Holotype, male (California Academy of Sciences), Sozan, alt. 400 metres, northern Formosa, March 29, 1932 (*J. L. Gressitt.*)

Differs from *holstii* Pocock in being light ochraceous-brown instead of bluish-olive, in having the lateral margins of tergites more broadly expanded but less stoutly produced posteriorly, the first tergite ending with an acute angle at each side, the legs much stouter, etc.

V.—*Two Notes of Abnormalities in commonly used Laboratory Animals.*

By G. E. H. FOXON, M.A., F.L.S. (Department of Zoology and Comparative Anatomy, University College, Cardiff).

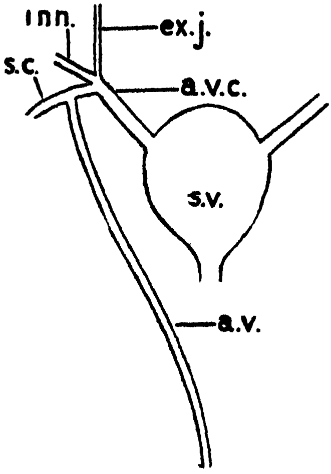
I. *A Specimen of* Rana temporaria *L. with an Abnormal Venous System.*

During the work of the first-year medical class my attention was drawn by a student (Miss D. M. R. Lewis) to a frog in which the course of the abdominal vein was not normal. It was at once apparent that the abdominal vein made no connexion with the liver. Further dissection has shown that the course of this vein is as shown in fig. 1.—that is, it enters the right subclavian vein distinctly before that vessel joins the anterior vena cava. Such a condition has previously been described by O'Donoghue (1931) as his example 17. O'Donoghue's specimen was a fully grown female; the present example is a fully grown male. It appears that the persistence of the anterior part of the embryonic lateral abdominal vein on the right side is of less frequent occurrence than on the left. As previously remarked, there is no connexion between the abdominal vein and the hepatic portal vein.

Whereas in O'Donoghue's specimen the abdominal vein was constituted normally posteriorly, this is not so in the present instance. Unfortunately it was not possible to complete the dissection while the animal was still fresh, with the result that preservation made the specimen unsuitable for fine dissection; thus it has been possible to trace only the principal veins of the leg and posterior trunk regions. The results of this dissection are shown in fig. 2.

Briefly the sciatic veins are normal on both sides and are continued as the renal portal vein at the outsides of the kidneys in the normal manner. The femoral veins are not normal. On the right side the portion of the femoral vein between the pelvic vein and the renal portal vein could not be found, so that the upper part of the femoral vein appears to be missing. Thus all the blood in the right femoral vein seems to have been conveyed through the pelvic vein into the abdominal vein. On this side, therefore, the renal portal vein is only a continuation of the sciatic vein, and instead of the femoral, pelvic, and abdominal being three distinct vessels, they are merely one continuous venous path.

Fig. 1.

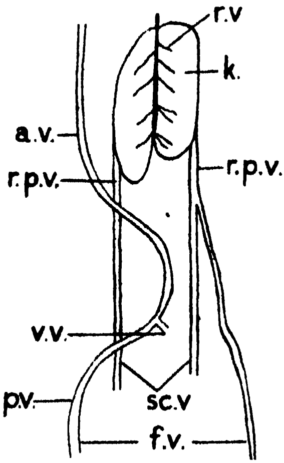


Venous system of abnormal frog; anterior region.

a.v., abdominal vein; *a.vc.*, anterior vena cava; *ex.j.*, external jugular vein; *inn.*, innominate vein; *s.c.*, subclavian vein; *s.v.*, sinus venosus.

On the left side of the body the sciatic vein is again normal, but the femoral vein on approaching the top of the leg passes dorsally towards the skin and no pelvic branch could be found. Actually at the hip region the femoral vein appears on the dorsal surface of the body wall, passing dorsal to the ilium and then entering the body-cavity from the roof. Here it runs anteriorly for a short distance before joining the sciatic vein to form the renal portal vein. Thus all the blood returning from the left leg would pass through the left kidney in the portal vessels. It would seem, therefore, that during life the left kidney had far more blood flowing through it than did the right. There is, however, no outward indication that this has had any effect on the degree of development of the kidney in question. The left kidney is slightly broader, but also slightly shorter than the right. There do appear to be more renal veins on the surface of the left kidney than on that of the right, but this difference hardly appears significant.

Fig. 2.



Venous system of abnormal frog ; posterior region.

a.v., abdominal vein ; *f.v.*, femoral vein ; *k.*, kidney ; *p.v.*, pelvic vein ; *r.p.v.*, renal portal vein ; *r.v.*, renal vein ; *sc.v.*, sciatic vein, *v.v.*, vesicle vein.

In view of the comparative rarity of frogs in which the abdominal vein enters the great veins on the right side, and of the most peculiar arrangement of the femoral veins, it seems desirable to place the occurrence of the present abnormalities on record.

II. *On the Occurrence of Specimens of* Asterias rubens *L. with Ten Tiedemann's Bodies.*

Two specimens of *Asterias rubens* which were dissected in the Final Class at the beginning of the current session were each found to have ten Tiedemann's bodies in place of the customary nine. The occurrence of a specimen with the extra body was first noted by a student (Miss Betty Lewis) and at the conclusion of the class the examination of the remaining twenty-five specimens revealed that at least one further example was present. In addition, there was one specimen in which ten Tiedemann's bodies appeared to be present, but the specimen had been dissected in such a manner as to make it impossible to be absolutely certain whether this were actually the case or not.

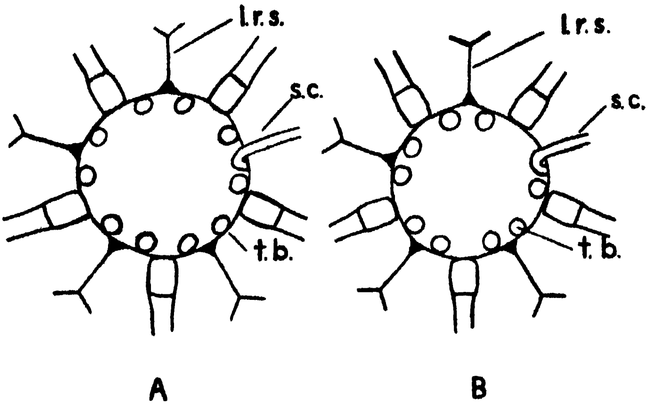
I have not been able to find mention in any of the standard text-books of the occurrence of specimens with more than nine Tiedemann's bodies, and Chadwick (1923) also makes no reference to such abnormalities.

The exact arrangement in one of the specimens is shown in fig. 3 A ; a normal specimen has been drawn in fig. 3 B for comparison. It will be noted that with both the normal and abnormal numbers a pair of bodies is found in each interradius, except that of the madreporite in the normal specimen, and that none of the bodies is opposite an interradial septum. Thus in the interradius of the madreporite, the stone-canal, being attached to the interradial septum, does not meet the circumoral water-vascular-ring in the position in which a Tiedemann's body would be found if this interradius were to be arranged in the same way as the others.

It is a well-known fact that in those species of Asteroids in which Polian vesicles are found one does not occur in the interradius of the madreporite. This can be easily understood, for here the stone-canal meets the water-vascular-ring in the same place as such a Polian vesicle would be found. In such cases, however, it seems that not only the Polian vesicle of that interradius is absent, but also one of the Tiedemann's bodies. See, for example, *Asterina gibbosa* in Sedgwick, vol. iii. fig. 136.

Whereas it is easy to imagine that the Polian vesicle must be suppressed in the madreporic interradius to make room for the stone-canal, it is not at all obvious why one of the Tiedemann's bodies should also be suppressed. The present abnormalities demonstrate that if each interradius has two Tiedemann's bodies a regular arrangement can be preserved, even in the madreporic interradius. The reason for the usual suppression of this particular body and the consequent introduction of asymmetry in the distribution of the bodies remains obscure.

Fig. 3.



(*a*) Diagram showing the arrangement of the Tiedemann's bodies in a specimen with ten bodies. (*b*) Diagram of the normal arrangement with nine Tiedemann's bodies.

i.r.s., interradial septum ; *s.c.*, stone-canal ; *t.b.*, Tiedemann's bodies.

It should be noted, in conclusion, that two, or perhaps three, specimens showing this variation in a total of twenty-six is between an eight and ten per cent. occurrence. It may be that such specimens occur more regularly than has hitherto been suspected.

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VI.—*The* Callineura *Group of the Genus* Plastingia *Butler* (*Lep.*: *Hesp.*). By Brigadier W. H. EVANS, C.S.I., C.I.E., D.S.O., F.R.E.S.

IN the *callineura* group of the genus *Plastingia* Btlr., 1870, the origin of vein 2 on the fore wing is much nearer the base than to the origin of vein 11 or vein 3. The type of the genus is *callineura* Feld.

ANALYSIS OF THE *CALLINEURA* GROUP.

1 *a* (10). UnH with at least some of the veins yellow, and usually with pale shining blue markings.
1 (2 *a*). UpH tornal quarter all yellow, extending to end of vein 3.

vermiculata How., 1878: ♂ Sumatra: type B.M. Fig. de N., 1894.

B.M. has 1 ♂, 2 ♀♀, Sumatra.

2 *a* (1). UpH cilia only yellow at tornus beyond vein 1 B.
2 *b* (7 *a*). UnH tornus broadly dark brown, due to yellow basal streaks in 1 B and 1 C not extending beyond mid-wings.
2 *c* (6). F line joining outer edges of spots in 7 and 6 directed to termen.
2 *d* (4 *a*). UnH vein 8 ochreous or red edged on both sides throughout and at base above vein 8 ochreous or red more or less overlaid by pale blue scaling: unF no pale blue scaling in 5. Uncus with side-horns
2 (3). F line joining inner edges of spots in 6 and 4 directed to termen: usually the spot in 4 is quite detached from the spot in 3 (always so in ♀); cell-spots subequal and usually centrally conjoined in ♂.

margherita. 3 subspecies. Clasp of (*a*) differs somewhat from rest.

(*a*) ♂ F spots in 3 and 4 contiguous. ♂ antennæ white nearly to base; ♀ club only white, as is usual in group. UpH discal band partly hyaline.

margherita Doherty, 1889: ♂, Margherita, Assam: type B.M. Fig. and copy by Swinhoe, 1913.

B.M. has 2 ♂♂, 1 ♀, Assam (Manipur, Nagas, Cachar).

(*b*) ♂ F spots in 3 and 4 wide apart. ♂ antennæ club only white.

miriam, nov.: ♂, Dawnas (*F. M. Mackwood*): type B.M.

B.M. has 2 ♂♂, 1 ♀, Burma (Dawnas); 1 ♂, 2 ♀♀, Siam (Chentaboon, Hoop Bon).

(c) As (b) but antennæ white nearly to base. UpH central band entirely hyaline.

manda, nov.: ♂, Hainan (Coll. *Rothschild*): type B.M.

B.M. has 2 ♂♂, 1 ♀, Hainan.

3 (2). F line joining inner edges of spots in 6 and 4 directed to dorsum, and usually the spots in 3 and 4 completely overlap or are conjoined: cell-spots never conjoined.

callineura. 3 subspecies.

(a) ♂ antennæ ochreous or white throughout. UpH spots partially hyaline. Very variable. Generally the Burmese form (*burmana*) has the veins below very red, the prevailing form in Malaya (*perakana*) has the basal yellow costal streak upF very broad, while elsewhere (Nias, Sumatra) it is narrow. An aberrant ♂ from Sumatra has only the club of the antennæ white.

niasana Fruh., 1909: ♂, Nias: type B.M.; ♂, fig. Swinh., 1913, as *callineura*.

Syn. *burmana* Evans, 1926: ♂, Dawnas: type, B.M.
Syn. *perakana* Evans, 1926: ♂, Negri Sembilan: type B.M.

B.M. has 1 ♂, 1 ♀, Assam; 1 ♂, 2 ♀♀, Karens; 2 ♂♂, 13 ♀♀, Dawnas; 1 ♂, Siam; 7 ♂♂, Malaya; 5 ♂♂, 2 ♀♀, Sumatra; 3 ♂♂, 2 ♀♀, Nias; 2 ♂♂, 1 ♀, Palawan.

(b) ♂ antennæ with club only white. UpH spots large, entirely hyaline. UnH veins very red and conspicuous bluish markings at base of costa and in 6.

callineura Felder, 1867: ♀, Java: type B.M. ♀ fig. of type refigured in Swinh., 1913. ♂ fig. in Seitz.

B.M. has 26 ♂♂, 19 ♀♀, Java.

(c) ♂ antennæ as in (b), otherwise generally resembling Burmese specimens of (a), though larger and cilia redder. One specimen more closely resembles the prevailing Malayan form.

rubida, nov.: ♂, Kina Balu: type B.M.

B.M. has 3 ♂♂, 3 ♀♀, Borneo.

4 *a* (2 *d*). UnH vein 8 only narrowly yellow below and not on the costal side.

4 (5). UnF no bluish scaling in 5, which is dark brown except for narrow yellow scaling under vein 6. Apart from this feature and the alignment of the F apical spots, this species exactly resembles typical *latoia* in all respects, except that unF the spot in 5 never overlaps the spot in 4, as is usual in *latoia*. ♂ antennæ shaft white.

derna, nov. : ♂ Marang, Sumatra (*W. Doherty*): type B.M

B.M. has 1 ♀, Tavoy ; 1 ♀, Singapore , 8 ♂♂, Sumatra ; 6 ♂♂ 2 ♀♀ Borneo ; 3 ♂♂, 2 ♀♀, Palawan

5 (4) UnH with the basal half of 5 entirely filled with bluish scaling, extending into 4 ♂ antenna with club white above only This species differs from *latoia* as follows — F cell-spots more separated, not overlapping at all spot in 3 also more separated from the spot in 2, not overlapping spots in 3 and 4 only just overlap orange streak in 1 B narrower, as in *latoia* Below no bluish scaling except in 5 F on F basal costal yellow streaks short, not reaching mid-wing, also veins 6, 7 and 8 suffused yellow, not narrowly edged as in *latoia* and veins below vein 6 not ochreous at all UnH much darker brown and markings broader, sordid white rather than yellow base of costa above vein 8 broadly and conspicuously sordid white, veins only narrowly ochreous edged from vein 4 to vein 8 : submarginal spots absent below vein 4 discal band broad and uniformly subhyaline

klanga, nov ♂, Perak (*W. Doherty*) type B.M

B M has only the type Dr A S. Corbet has a ♂ from Kuala Sloh, Malaya

The genitalia of *derna* and *klanga* are sufficiently distinct to confirm their status as good species In *klanga*, the uncus has no side-horns

6 (2 c) F line joining outer edges of spots in 7 and 6 directed to dorsum UnF with basal half of 5 ochreous, usually conspicuously overlaid bluish scaling, which does not extend into 4 UnH at base costa a broad ochreous streak more or less overlaid bluish scaling ♂ antennae with shaft ochreous or white Uncus with side-horns

latoia. 2 subspecies.

(*a*) Very much darker due to reduction of yellow areas UnH veins only faintly yellow and cell entirely dark brown except at base.

bardia, nov : ♂, Dawnas (*W. H Evans*) : type B.M.

B.M. has 13 ♂♂, 8 ♀♀, Dawnas, Burma.

(*b*) Markings broad. UnH veins conspicuously yellow and cell inwardly broadly yellow-edged

latoia Hew., 1868 : ♀, Singapore · type B.M. Fig. in Hew., 1873. ♂, fig. Dist., 1886 ♀, upperside fig. Swinh., 1913 (his ♂ is a ♀ *aurantiaca*). The fig. of *latoia* in Seitz unrecognisable.

B.M. has 4 ♂♂, 2 ♀♀, Mergui; 1 ♀, Siam; 1 ♂, 4 ♀♀, Malaya: 7 ♂♂, 4 ♀♀, Sumatra; 1 ♂, 1 ♀, Lingga Is.; 1 ♀, Batoe Is. (1 ♂, Java); 7 ♂♂, 7 ♀♀, Borneo.

7 *a* (2 *b*). UnH yellow streak in 1 B extends nearly to the termen and that in 1 C reaches the termen, giving the tornal area a much yellower appearance. Uncus without side-horns.

7 *b* (9). F line joining outer edges of spots in 7 and 6 directed to dorsum and spots in 2 and 3 well separated. UnF with bluish scaling in 5, as well as unH at base of costa. H discal spots partially hyaline.

7 (8). UpF cell brown to base and the extreme base of 2 also brown.

flavia. 3 subspecies.

(*a*) Antennæ with only the tip of the club below apiculus yellow. Smaller, F 15½ mm.

natuna Fruh., 1909: ♂, Natuna: type B.M.

B.M. has 1 ♂, Mergui (Lenya Valley); 1 ♂, Langkawi Is.; 4 ♂♂, Batoe Is.; 1 ♂, Natuna Is.

(*b*) Antennæ entire club yellow. Larger, F 18 mm.

fruhstorferi Mab., 1893: ♂, Java: type B.M. Fig. El. & Edw., 1896, and in Seitz.

B.M. has 1 ♂, Malaya (Perak); 1 ♂, Sumatra; 19 ♂♂, 21 ♀♀, Java; 1 ♂, Borneo (Pulau Laut).

(*c*) Similar, but upF basal costal yellow streak narrow, against costal vein and not extending to the costa.

flavia Stgr., 1889: ♂, Palawan. Fig. in Seitz.

B.M. has 1 ♂, 2 ♀♀, Palawan.

There is considerable variation in the form of clasp: in *natuna* it is very like *helena*; *flavia* has it very different: the Sumatran specimen of *fruhstorferi* differs only slightly from Javan specimens, while the Malayan specimen more nearly resembles *natuna* and the Pulau Laut specimens differs still more, though not so much as *flavia*. More material may necessitate a revision.

8 (7). UpF entire base yellow up to spot in 2. Antennæ only yellow at end of club. Abdomen in ♂ entirely yellow above and not striped as in rest of group.

helena Btlr., 1874 : ♂, Borneo : type B.M. Fig. Btlr., 1874, and in Seitz.

B.M. has 1 ♂, 1 ♀, Malaya ; 5 ♂♂, 3 ♀♀, Sumatra ; 14 ♂♂, 3 ♀♀, Borneo.

9 (7 *b*). F line joining outer edges of spots in 7 and 6 directed to termen : spots in 2 and 3 overlapping and conjoined, making the discal band compact. Below no bluish scaling in 5 F or at base costa H. UnH ♂ without, ♀ with, the usual bluish spots. ♂ antennæ shaft ochreous and club black : ♀ shaft black and only tip of club before apiculus is ochreous : UpH orange band opaque.

aurantiaca. 3 subspecies.

(*a*) F 19 mm. UnF dark submarginal spots larger and vein 2 not ochreous. UnH dark streak above vein 7 continuous and markings less broken in 1 C.

montivaga Pendlebury, 1939 : ♂, Malaya.

B.M. has 1 ♀, Malaya (Perak) ; 3 ♂♂, Sumatra ; 1 ♂, 1 ♀, Lingga Is. ; 3 ♀♀, Batoe Is.

(*b*) F 15 mm. UnF vein 2 ochreous and unH markings more broken up.

aurantiaca Elwes & Edwards, 1897 : ♂, Pulo Laut : type B.M. Fig. ♀, Swinh., 1913, as ♂ *latoia*.

B.M. has 10 ♂♂, 7 ♀♀, Borneo.

(*c*) ♀ F 21 mm. Strikingly larger and redder. Antennal club with upper half ochreous.

aura, nov. : ♀, Borneo, Kina Balu (*J. Waterstradt*) : type B.M.

B.M. has 2 ♀♀, Borneo, Kina Balu.

10 (1 *a*). UnH no yellow veins and below no bluish scaling. Antennæ black, only white under end of club. F line joining outer edges of spots in 7 and 6 directed to dorsum. UnH all space 8 yellow.

liburnia. 2 subspecies.

(*a*) Above yellow markings narrower : F spots in 2 and 3 widely separated.

liburnia Hew., 1868 : ♀, Philippines : type B.M. Fig. Hew., 1873, and in Seitz.

B.M. has 6 ♂♂, 4 ♀♀, Mindoro ; 6 ♂♂, 2 ♀♀, Luzon.

(*b*) **Above markings broad : spots in 2 and 3 on F overlap and usually conjoined. UpF spot in 2 continued (non-hyaline) to base of space 2.**

minda Evans, 1934 : ♂, Mindanao : type B.M.

B.M. has 8 ♂♂, 2 ♀♀, Mindanao ; 1 ♂, Negros Is.

Note.—The abbreviations are the same as those used in the author's 'Identification of Indian Butterflies,' 2nd edition, 1932.

BIBLIOGRAPHICAL NOTICES.

Embryology of Insects and Myriapods. By OSKAR A. JOHANNSEN and FERDINAND H. BUTT. London : McGraw-Hill Publishing Co., Ltd., 1940. 462 pp., 370 figs. Price 35*s*.

THE embryology of insects has so far received scanty attention on the part of general zoologists, probably because the literature on the subject, although voluminous, is very scattered. The appearance of the present textbook is, therefore, most welcome, not only from the point of view of an entomologist. The book is the outcome of a course of lectures given at the Cornell University over a period of twenty years by the senior author, and now continued by the junior author. It contains, however, much more material than is required for the ordinary student, and this makes it indispensable as a handbook for research workers as well. The first part of the book comprises twelve chapters dealing with general problems of the embryonic development, while the second treats in a more detailed way the embryonal history of typical representatives of each order of insects and myriapods. A feature of the book liable to cause some disappointment is the strict limitation of contents to the pure morphology of development, while the physiological and experimental sides are left outside its scope. This omission is, however, intentional, and it would be unfair to criticise the authors for it. Many of the illustrations are original, others have been carefully selected from the best sources. A bibliography of 36 pages, including papers published up to 1939, concludes this excellent textbook, which promises to become a classic on the subject. B. P. U.

Entomophagous Insects. By CURTIS P. CLAUSEN. London: McGraw Hill Publishing Co., Ltd., 1940. 688 pp., 257 figs. Price 49*s*.

ENTOMOLOGICAL literature generally, and that of applied entomology in particular, is assuming proportions which make it increasingly difficult for a field-worker, or a serious student of any single problem, to find the necessary information, scattered in scores of publications, some of them difficult to obtain, others written in less known languages. This makes the preparation of comprehensive summaries on specially selected subjects a crying need of applied entomology, and if a model for such summaries is wanted, the book under review may be safely regarded as such. The aim of the book is to provide a ready guide to a knowledge of all groups of insects that are predators or parasites of other insects. Over 200 families of insects, belonging to 15 orders, are dealt with one by one, and the data on each family are grouped under the main headings of family character, the host preferences, biology and habits, and immature stages, with discussions on special subjects pertinent to the family. The more generalised predators are discussed without great detail, but the groups with a high degree of specialisation are given particular attention. The text is liberally interspersed with references to the excellent bibliography, thus enabling the reader to trace the original source of the information. The only criticism that can be made in this respect is that in a few cases such references are omitted without sufficient justification. To give some examples, on p. 55 all we read about the family Stephanidæ is the following:—"This is a group of exceedingly rare insects, represented by a few genera and species which, so far as the host preferences are known, are parasitic upon the larvæ of wood-boring insects." The absence of any references to original papers may cause endless trouble to an entomologist who happens to find a member of this family and would wish to know more about it. Similarly, on p. 397, it is said about Conopidæ:—"There is some evidence to indicate that certain species are parasitic in Acrididæ," but the reader is thrown on his own resources to find out that evidence. However, such omissions are not numerous and can be made good in the next edition of the book, which will certainly be required before long. The book is well illustrated, and special attention has been paid to figures of the immature stages of parasitic insects, which are so important for a field-worker.

B. P. U

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VII.—*Systematic Notes on the Cetoniid Coleoptera and Descriptions of a few new Species.* By Gilbert J. Arrow, F.Z.S., F.R.E.S., British Museum (Natural History).

The recent acquisition by the British Museum of the collection of Cetoniid Coleoptera formed by the late A. Bourgoin, containing the types of nearly all the numerous species described by him and a few of those of other authors, has afforded the opportunity of comparing these with types and other specimens in the National collection. A certain number of synonyms have been revealed as a result and the following notes record these, as well as a few other observations which it seems desirable to publish. As the generic names at present in use in this family are largely based upon geographical considerations, I have grouped the notes geographically.

The most important systematic task remaining for the future in this family is a regrouping of the species and elimination of superfluous genera. The multiplication of these has in some parts of the group reached its limit, each species being furnished with a separate genus, and the further extension of this *reductio ad absurdum* seems to be the only logical alternative to the abandonment of many of the names contained in the latest catalogue. It has been pointed out by Kolbe (Stett. Ent. Zeit., 1893, p. 209) that in the various African species belonging or related to *Goliathus*, while the females are alike in the form of the legs, those of the males differ more or less from them according to the size of the species. The giant forms, *G. goliathus*, *regius* and *cacicus*, have the front tibia of the male devoid of teeth, in the small forms, (*Hegemus*) *vittatus*, etc., there are three teeth, as in the female, and in those of intermediate size two teeth may be present. A similar difference, according to size, may be found within the limits of a species—large specimens of *G. fornasinii* Bert. have two tibial teeth and small ones three, large examples of *G. albosignatus* Boh. have only a terminal tooth while small ones may have two distinct teeth. Several genera have been based on this character, in combination with the form of the cephalic horn of the male, which consists of a double-ended process said in some cases to arise from the clypeus and in others from the hinder part of the head. But in this group the horn is never an extension of the front margin of the clypeus, as in many beetles. The middle region of the head in front of the eyes is elevated in all males but, while in some the horn rises vertically from its base and then bends forward, in others it extends horizontally, leaving only the front part of the clypeus free and in the largest species is produced to the front of the clypeus before becoming free. Kolbe has given a number of varietal names to specimens of different sizes of *G. fornasinii* (or, as he calls it, *Fornasinius insignis*) according to the various forms assumed by the horn of the male, which no doubt represent stages in its development. Considering the extreme instability of these male features, I cannot recognise the differences, either of legs or head, as sufficient for the establishment of genera, and I therefore regard *Goliathinus*, *Fornasinius*, *Myctoplerus*, *Argyrophegges*, *Hegemus*, and probably *Sphyrorrhina*, as inseparable from *Goliathus*.

An important feature of all the forms just mentioned is the obliquity of the base of the pronotum on each side. The more numerous species in which the base-line is at right-angles to the axis of the body are distributed among a large number of genera, many of which are founded on similar characters of the male alone and equally undefinable. Most of the genera at present accepted for those whose most striking feature is the prolongation in various ways of the head of the male are incapable of definition owing to the liability of this sexual character to be absent in particular species or specimens. In 1837 Hope gave the name *Dicronorhina* to *Cetonia micans* F. and its allies and *Eudicella* was introduced by White two years later for a variety of the common *Goliathus smithi* Macl. *Cœlorrhina*, *Stephanorrhina*, *Genyodonta*, *Neptunides* and many other names have been since applied to other closely related African species, according to the varying shape of the head of the male, although the processes are not only absent in the males of some but in the females of nearly all. *Genyodonta* differs from *Eudicella* in having the tip of the clypeus of the male less strongly developed and the posterior (frontal) process single instead of double, but the distinction vanishes in *Eudicella mutica* Jans., in which these processes are quite absent. The female of *Genyodonta flavomaculata* F. has the front tibia armed with two teeth instead of three, but in the nearly allied *G. pallida* Gerst. there are three teeth as in *Eudicella*. *Stephanorrhina* is equally undefinable. It was devised by Burmeister as a subgenus of *Cœlorrhina* for *C. guttata* Oliv., and characterised by the T-shaped horn on the hinder part of the head of the male. It has been adopted for various species with a similar coloration and arrangement of white spots upon the elytra, although the head is quite hornless in some, e. g., *simillima* Westw. ; indeed, the colour-scheme is at least as good a guide to the affinities of the species as the secondary sexual features, but unfortunately it is no more capable than the latter of precise definition. The white spots are absent in *Stephanorrhina simplex* Pér., as well as in *Asthenorrhella leonina* Westw., which has an equally good title to be included in *Stephanorrhina*.

Kolbe has adopted the view (Ueber die Gattung *Stephanorrhina* und ihre Arten, Stett. ent. Zeit., liii., 1892, p. 145) that the cephalic processes are useless for generic diagnosis and has treated the elytral pattern as the essential feature, although wisely refraining from attempting a diagnosis. He has described a hornless male of the type-species *guttata* and dignified it with a varietal name (*hybrida*), a rather unnecessary proceeding, since every degree of transition no doubt occurs. Similar hornless examples of *princeps* Oberth. have been described by Schürhoff as representing a supposed distinct species *S. pygidiomaculata*.

The exclusion of these inconstant features of the male alone for the purpose of generic diagnosis will necessarily lead to a search for characters of more fundamental importance and so to a more scientific classification. One of the organs which, in the present group, displays the greatest diversity of form, namely, the maxilla, is, like the head and the fore-legs, subject to sexual difference. The fact is that, despite the great superficial differences often shown by the males, the species of this group are related very closely indeed and, until some sounder basis for subdivision has been devised, the most rational course appears to be to regard them as forming a single genus. The name *Dicronorrhina* Hope has, I believe, the best title to be used as its designation.

AFRICA.

Goliathus fornasinii Bert. (=*Myctoplerus proboscideus* Fairm.).

Dicronorrhina guttata Oliv., *simillima* Westw. and *julia* Wat. are three species, not one, as catalogued, for, in spite of Kraatz's disbelief, it is certain that the figure and description by Westwood of *Stephanorrhina simillima* were made from the specimen in the British Museum mentioned by Waterhouse and that the species is not *julia* Wat. The spine added by Westwood to the hind tibia in his figure was probably introduced in putting the finishing touches to his work in the absence of the specimen. *S. bella* Wat. is only a phase of *simillima* with rather more rosy colour upon thorax and elytra and *westwoodi* Kr. is another synonym.

Trapezorrhina is a redundant genus, *T. sordida* Hauser (1904) being congeneric with *Mazoe albonotata* Péringuey (1896).

Gnathocera propinqua Bourg. is a synonym of *G. trivittata* Swed. Bourgoin's series of this very variable insect, from the Kakamega Forest, shows the complete transition from the typical to the *afzelii* phase.

Schürhoff (Bull. Ann. Soc. Ent. Belg., lxxviii. 1938, p. 189) wrongly united the Abyssinian *Pachnoda massajæ* Gestro with *P. thoracica* F., of Egypt and Arabia. They are easily distinguished by the white abdominal stripes and pygidial spots of the former, as well as the quite different ædeagi of the males.

Kraatz formulated a genus *Pseudoprotætia*, for which he named as type *Protætia stolata* Burmeister, but the latter misapplied to his species the name used by Olivier and Fabricius for a very well-known Australian insect. Both authors mention the type of this in the British Museum (Banks). This species, called by Fabricius *Cetonia fasciata* in 1775 (Syst. Ent.), was renamed *Cetonia stolata* in 1781 (Species Insect.), and now figures in the catalogues as *Glycyphana brunnipes* Kirby. Olivier, although recognising it as Australian, remarked that it was common in Senegal, and Gory & Percheron's 'Monograph' transferred the name to a West African species. Still further confusion was caused by Fabricus in describing a second *Cetonia fasciata* (now known as *Pachnoda savignyi* G. & P.) in Ent. Syst., 1792. The name *stolata*, being a synonym of *Glycyphana fasciata* must disappear, and the African insect, described at length by Burmeister, may be called

Pseudoprotætia burmeisteri, nom. nov.

Stichothyrea guttifera Afzel (=*mutabilis* Bourg.). Bourgoin applied the name *guttifera* to a species of *Oxythyrea*, but the careful description by Afzelius leaves no doubt as to the true identity of his insect

Pilinurgus squamosus Moser (=*hulstærti* Burgeon). The Bourgoin collection contains co-types of both these.

Cœnochilus glabripennis and *kamerunus*, of Moser, are both, in my opinion, synonyms of *C. glabratus* Boh.

Genuchus crassipes Arrow, *felix* Arrow, *brevitarsis* Moser and *rubrocinctus* Bourg. belong to the genus *Ogmothorax* of Kraatz, but it is very doubtful if it will be possible to maintain this, for the transition is almost complete.

Polyplastus ovatus Wat. (=*æquicostatus* Bourg.).

Pileotrichius podicalis Kr. (=*burgeoni* Bourg.).

P. austerus Bourg. (=*sobrinus* Arrow).

Trichius bifasciatus Moser (=*vuilleti* Bourg.).

MADAGASCAN REGION.

Zebinus flavolimbalis Fairm., the type-species of the genus, was described by Fairmaire six years previous to its creation under the name *Pogonotarsus flavovirgulatus*, and this specific name must therefore be used.

Rhynchocephala rufoscutata Fairm., despite a superficial resemblance to *R. hildebrandti*, belongs to the genus *Doryscelis*. The specimen in Bourgoin's collection is no doubt a co-type, if not the sole type, of the species. It bears the cited locality name Diego Suarez. The locality of the specimen in the Paris Museum appears to be uncertain.

Ischnotarsia Kr. (=*Hyphelithia* Kr.). This genus differs from *Coptomia* only in the bloom which covers the upper surface and is liable to disappear. *I. stupida* G. & P. is nearly related to *Coptomia marginata* Wat. Nearly related also is *pratensis* G. & P., referred to *Anochilia* in the Junk catalogue. The type of *Coptomia viridicans* Bourg. is a small specimen of *C. olivacea* Wat.

Pygora versicolor Wat. was badly placed in that genus. It would have been better assigned to *Euchilia*.

The slight differences which led Bourgoin to separate as two species *Mausoleopsis scillerei* Bourg. (one specimen) and *M. comoriensis* Bourg. (two specimens) seem to me to be individual only. The ædeagi are essentially alike.

ORIENTAL REGION.

Rhomborrhina heros G. & P. (=*chatenayi* Bourg.). This form, in which the black patch bordering the scutellum is a little narrower than that of the typical *R. resplendens* Swartz, should, in my opinion, be regarded as a variety of that species.

R. fortunei Saund. (=*nitida* Bourg.).

R. subopaca Arrow (=*vuilleti* Bourg.).

Glycyphana quadricolor Wied. (=*huyghei* Bourg.). This species is widely distributed and very variable.

G. nepalensis Kr. (=*roquesi* Bourg.). Bourgoin's type is a specimen destitute of the bloom to be found upon fresh examples. He appears to have eventually recognised, as conspecific with his type, specimens similar to Kraatz's type, which I have seen.

G. minima Bates, 'The Entomologist,' xxiv. 1891, suppl., p. 21. I omitted this from the volume of the Fauna of British India dealing with the Cetoniinæ, believing the locality cited (Kulu, Punjab) to be incorrect. The type is probably of Malayan origin, but I consider *G. nicobarica* Jans., from the Nicobar Is., to belong to the species, and the latter name must therefore give place to that of Bates.

G. bang-haasi Bourg. and *G. robusta* Mohn. are doubtfully distinct from *G. vernalis* Wall.

G. incongrua Jans. (=*Oxycetonia costigera* Bourg.).

G. maculiceps Moser (=*disparilis* Arrow). This synonymy was due to the inaccessibility of German literature during the war.

G. magnifica and *rubripes*, of Moser, appear to be colour-phases of the very variable *G. papua* Wall.

G. francolina Burm. *Astræa moseri* and *simillima* Bourg. are varieties of this abundant Philippine species, of which other names are *flavopunctata* Bl. (*Taeniodera*), *tigrina* Mohn., *margaritacea* Mohn., *maculiventris* Hell., *multimaculata* Moser, and (var.) *rubra* Bourg.

Protætia cariana Gestro (=*albovermiculata* Bourg.).

P. rana Arrow (=*Glycyphana fucata* Bourg.).

P. caudata Arrow (=*Cetonia chalcitis* Bourg.).

P. fusca Herbst (=*taiwana* Niij. & Mats.).

P. lenzi Har. This species, of which only female specimens were described, proves to be a remarkably dimorphic insect, *P. hondana* Arrow, being its male. A series of specimens taken at the sap of *Quercus variabilis* at Osaka, Japan, by Mr. Imanishi, have been sent to me. They reveal beyond question that the dull green *hondana* and the brilliant coppery *lenzi* belong to the same species.

P. culta Wat. (=*Potosia grisea* Niij. & Mats.).

P. auripes Hope. I am unable to distinguish *Potosia salvazai* Bourg. from this species, and *Potosia morgoni* Bourg. I believe to be identical with (*Cetonia*) *pretiosa* Nonfr. Nearly related to these and to *P. pryeri* Jans. is *P. lewisi* Jans., described in 1888, together with the last, but omitted from the Junk catalogue.

Clinteria oberthuri Arrow (=*garnieri* Bourg.). I regard this and also *malayensis* Wall. as varieties of *C. ducalis* White.

Thaumastopeus nicobaricus Jans. (=*nigrovirens* Bourg.). The very common species *Thaumastopeus pullus* Billb. is incorrectly called *nigritus* in the Junk catalogue. That name was misapplied to it through confusion with *Agestrata orichalcea* L. (=*nigrita* F.).

Macronota quadrilineata Hope (=*aubaili* Bourg.).

M. furcata Fairm. (=*argodi* Bourg.). *Macronota vouauxi* Bourg. was described from a female specimen with immaculate thorax of the same species. The very brief description refers in error to Fairmaire's species as *M. furcifera*.

M. schonfeldti Kr. (=*formosana* Niij. & Mats.).

Gnorimus oksukæ Niij. & Mats., described from a female specimen, is a species of *Trichius* and perhaps a variety of *T. donitzi* Har.

AUSTRALIA.

Diaphonia notabilis White, the type of which is in the British Museum, has been the subject of much confusion. It is deceptively like *D. atra* (=*tæniata*) Schoch, but differs by its extremely coarsely strigose pygidium, decorated with two black spots, and the very sharp hind angles of the pronotum. The front tibia of the male has three teeth and the club of the antenna is very long. It has been taken by Mr. F. P. Dodd in North Queensland.

D. dispar Newm. (=*satelles* Blackb.). The types of both authors are also in the British Museum.

D. nigriceps Bl. (=*euclensis* Blackb.). I have been able to compare Blackburn's type with a specimen compared by Bourgoin with Blanchard's.

In conclusion I append descriptions of a few species of Cetoniidæ for which no names appear at present to exist. The types of all these are in the British Museum collection.

Macronota eximia, sp. n.

Viridis, supra partim vel toto opaca, subtus nitidissima, plus minusve igneo-micans, elytrorum margine externo plerumque punctis parvis albis pluribus ornato, abdominis segmentis lateraliter anguste albido-marginatis; elongata, capite nitido, bilobato, grosse punctato, postice medio lævi, carinato; pronoto antice fortiter punctato, postice medio leviter bi-impresso, lateribus antice convergentibus, postice fere parallelis, basi medio fortiter lobato; elytris unicostatis, extus leviter sinuatis:

♂, pronoto antice anguste albomarginato, tibia antica acuminata, media et postica subtus dense flavo-pilosis, hac intus longe penicillata, pygidio utrinque conice elevato, abdomine subtus arcuato:

♀, tibia antica acute tridentata, tibia media extus fortiter unispinosa, pygidio late excavato.

Long. 17–20 mm.; lat. max. 8–9 mm.

FEDERATED MALAY STATES: Pahang, Cameron Highlands, Rhododendron Hill, 5200 ft. (*H. M. Pendlebury*, May, June).

This species is related to *M. ludekingi*, but has a number of well-marked peculiarities. The clypeus is strongly excised, as in *M. ludekingi*, the basal lobe of the pronotum is rather shorter than in that species and just before it there is a deep linear impression on each side of the middle, the pygidium is longitudinally impressed in the posterior part in the male, and has a large roundish depression in the female. The hind tibia of the male is dilated and hollowed in its posterior half, the hollow filled with close erect yellow hairs, the inner spur is long and slender and the margin adjoining it bears a brush of very long hairs. The middle tibia also bears dense pale velvety hairs beneath and its outer edge is without the sharp spine found in the female. The abdomen is arched beneath in the male and there is a longitudinal median groove in both sexes.

Macronota rotundicollis, sp. n.

Nigra, elytris (marginibus interioribus exceptis) rufis, maculis ochraceis ornata, clypeo ovato, nitido, punctato, fronte rugoso, tuberculo mediano instructo ; pronoto fere rotundo, dense punctato, breviter setoso, angulis posticis obtusis, basi medio late lobato ; elytris opacis, apicem versus angustatis, margine laterali vix sinuato ; pygidio lato, plano, erecte setoso, corpore subtus medio nitido, parce punctato, lateraliter rugosulo ; tibia antica acute tridentata, media fortiter postica que minute spinosa :

♂, clava antennali longissima, abdomine subtus excavato.

Long. 15 mm. ; lat. max. 7 mm.

S. INDIA : Shevaroy Hills, Yercaud, 4500 ft. (April, May).

The single specimen was presented by the Coimbatore Museum. It resembles *M. mouhoti*, Wall., of Burma and Siam, but is of rather shorter form, not distinctly tapering behind, with the clypeus oval and not excised in front and the pronotum relatively smaller, more contracted behind and nearly round. Its upper surface is a little impressed in the middle behind, but the elytra are rather flat, with a feeble longitudinal costa only upon each. The colour is black, with red elytra and sulphur-yellow blotches, consisting of a small patch on each side of the head, a broad median stripe upon the pronotum and a small spot on each side, the entire scutellum, four oval spots bordering the elytral suture behind and placed close together, and three at the outer margin of each elytron, the first behind the shoulder and the last at the hind margin. The sides of the sternal plates, a double row of blotches at the sides of the abdomen and a large patch upon the pygidium are of the same yellow colour.

The unique type-specimen is a male, with the antennal club much longer than the footstalk and the abdomen deeply channelled beneath.

Macronota coorgica, sp. n.

Nigra, elytris sæpe, antennis, tibiis tarsisque rufis, corpore supra lineis et maculis pygidio que macula trilobata ornatis, corporis subtus lateribusque albidis vel flavis; elongata, supra plana, capite antice nitido, crebre punctato, margine antico leviter trisinuato, prothorace sat angusto, lateribus antice convergentibus, postice fere parallelis, basi leviter trisinuato; elytris postice attenuatis, leviter unicostatis, marginibus externis lævissime sinuatis; corpore subtus nitido, parce punctato; tibiis anticis acute tridentatis, posterioribus 4 fortiter unispinosis:

♂, pronoto angustiori, tibia postica intus longe ciliata, abdominis medio leviter canaliculato, clava antennali longissima;

♀, pronoto paulo latiori, angulis lateralibus magis prominentibus.

Long. 15–16 mm.; lat. max. 6·5 mm.

MADRAS, Coorg: Sidapur, 3000 ft. (March), Santikoppa (May), Sonawarpet (*L. Newcome*, July).

This is nearly related to *M. perraudieri* Fairm., which appears to range from Assam to Formosa, but the white elytral spots of the latter have coalesced to form lines in the present species. It is rather elongate in shape, flat above, with the upper surface opaque, except the front part of the clypeus, of which the anterior edge is feebly emarginate. The pronotum is heptagonal, rather narrow and parallel-sided in the male, gently lobed behind, with well-marked hind angles, and not hollowed at the base. The head is decorated with two and the pronotum with four longitudinal pale lines. The scutellum is black, with a pale circumference, and the elytra black or red, rather flat, tapered behind, each with a pale marginal line, interrupted at the shoulder, uniting with two lateral spots and returning close to, but not adjoining, the sutural margin. There is also an oblique median line extending from near the shoulder to near the middle of the suture. The pygidium has a trilobed leaf-like pale patch.

Macronota ovaliceps, sp. n.

Nigro-picea, vix nitida, curta, omnino pubescens, scapulis albidis, corpore supra pilis flavis longis haud densis vestito, sed elytris utrinque plagis 3 externis pilis brevioribus et densioribus ornatis, capite medio carinato, crebre punctato, ante oculos utrinque profunde inciso, clypeo ovali, antice rotundato: pronoto leviter transverso, crebre rugose punctato, medio carinato, lateribus medio angulatis, angulis anticis et posticis paulo productis, illis acutis, basi medio leviter lobato et hic depresso; elytris sat brevibus, crebre rugulosis, singulo costa nitida diviso; tibia antica acutissime tridentata; ♂, clava antennali quam stipitem longiori, abdomine subtus profunde excavato.

Long. 15 mm.; lat. max. 8 mm.

Burma: Sima (*P. M. R. Leonard*, Aug.).

The type is unique. It resembles *M. vuilleti* Bourg. in its coloration and general appearance, but differs from it in many important features. The hairy clothing is less close, except upon the elytra, and the three pale marks with which each of these is decorated and which occupy the same positions as in that species are much less well defined and consist only of pale yellow hairs. The pygidium also bears a small patch of pale hairs in place of the bright yellow mark in the other species. The most notable feature of *M. ovaliceps* is the great narrowing of the head at the points of insertion of the antennæ, its width there being only about one-third of its total width measured across the eyes. The clypeus from this point is a little longer than it is wide and oval in shape, its anterior part uniformly rounded. The forehead bears a sharp longitudinal carina, continued upon the clypeus, and is clothed with short erect hairs. The pronotum also bears a longitudinal carina, which ends before reaching the base. It is densely and rugosely punctured and depressed in the middle of the basal half. The front angles are rather sharply produced. The elytra are short, very broad at the base and narrowed from shoulders to apices.

M. ovaliceps is possibly related to *M. bipunctata* Schürh. from Yunnan, the clypeus of which is excised in front, while the pattern is evidently much more sharply defined.

Costinota decora Schürh. is another Indian insect unknown to me, which, judging by the description of its hairy upper surface and narrow unnotched clypeus, may bear some relationship to *M. ovaliceps*, although differing conspicuously in its yellow-striped head and thorax.

Glycyphana aurora, sp. n.

Viridis, supra opaca, subtus nitida, pedibus flavidis, corporis subtus lateribus late albidis, pronoti basi et linea mediana, scutello elytrorumque parte scutellari læte igneo-rufis, pronoti punctis discoidalibus 4 et lateralibus 2, elytri singuli punctis 8 vel 9, pygidii punctis 4 basalibus albidis ; capite plano, subnitido, crebre punctato, margine antico medio depresso, vix exciso ; pronoto haud lato, lateribus crebre punctatis, marginibus lateralibus medio angulatis, postice fere rectis et parallelis, angulis posticis nullis, scutello modice angusto ; elytris extus modice punctatis, intus punctato-striatis, angulo suturali haud fortiter spinoso ; pygidio transverse strigoso, breviter setoso ; corporis subtus lateribus subrugosis, medio parce punctato ; tibiis anticis acute bidentatis :

♂, tibia intermedia intus dense flavo-hirta, tibia postica leviter arcuata.

Long. 9–10 mm. ; lat. max. 4·5–5 mm.

Solomon Is. : Tulagi (*H. T. Pagden*, July to January). Taken on the flowers of *Antigone.*

This beautiful little beetle is nearly related to the Moluccan *Glycyphana aromatica* Wall. and *glauca* Bl., which have almost the same pattern of white spots on a green background, but with two instead of four discoidal spots upon the pronotum, and both of which also show, in certain specimens, a similar rosy suffusion of the pronotum and scutellum. *G. aurora*, however, is smaller and narrower in shape, the clypeus is only feebly bilobed, the pronotum more distinctly angulate at the side and less broad at the base. The pale legs and the dense hairy fringe at the inner side of the middle tibia of the male are also distinctive of the new species. The rosy dorsal area is much brighter and more extensive in *G. aurora* than in the related species, and extends backward as far as the middle of the elytral suture.

Myoderma latipennis, sp. n.

Nigra, opaca, ubique brevissime setosa, breviter ovata, convexa, capite postice sicut pronoto dense rugoso, clypeo

excavato, fortiter punctato, margine antico medio leviter producto; pronoto convexo, lato, lateribus fortiter rotundatis, postice convergentibus, angulis posticis fere rectis, scutello distincte punctato; elytris brevibus, apicem versus dilatatis, dense punctatis, singulo 5-costato, costa humerali abbreviata; pygidio densissime rugoso; pedibus sat gracilibus, tibia antica acute tridentata.

Long. 13 mm.; lat. max. 7·5 mm.

SIERRA LEONE: Njala (*E. Hargreaves*, May).

Only the unique type is known.

M. latipennis is very distinct by its short broad form and dull black colour, the entire surface being very densely punctured or rugulose and clothed with minute setæ. It is plump and convex, the clypeus hollowed and a little produced in the middle of the front margin, the pronotum broad, strongly rounded at the sides, which converge behind, with sharp but not acute hind angles and gently trisinuate base. The elytra are short, of the width of the prothorax at the shoulders and dilating strongly towards the end. The scutellum and elytral costæ are distinctly punctured, the intervals between the latter finely rugose, the pronotum and pygidium very densely rugose. The legs are fairly long and the front tibiæ acutely tridentate.

I prefer the generic name *Myoderma*, in use for 80 years, to the form *Myodermum*, substituted for it in the Junk catalogue. Its author so emended it, no doubt as being more euphonious, and there is no conceivable advantage in replacing it by the less euphonious form.

Myoderma striata, sp. n.

Nigra, vix nitida, elytris pygidioque læte rufis, corpore toto breviter fulvo-setoso, elytrorum setis dorsalibus parum perspicuis, capite rugoso, clypeo excavato, margine antico medio leviter producto; pronoto lato, convexo, fortiter rugose punctato, lateribus rotundatis, angulis posticis fere obsoletis, basi arcuato, vix sinuato; scutello elytrisque distincte punctatis, paulo nitidis, elytris profunde striatis, intervallis dorsalibus equalibus, lateralibus plus minusve alternatis; pygidio leviter rugosulo, sat dense fulvo-hirto, pectore, abdomine subtus pedibusque modice haud longe hirsutis, tibiis anticis acute tridentatis.

Long. 13–15 mm.; lat. max. 7·5–9 mm.

TANGANYIKA: Msagaa, 35 miles East of Singida (*E. Burtt*, between October and December).

This species differs from most of its congeners in having the dorsal part of the elytra deeply striate and the intervals equal and not alternately elevated, as they are in the lateral part. It rather closely resembles *M. rufipennis* Gestro, but, in addition to the different elytra, the pygidium is bright red and the whole surface of the body is less densely punctured and clothed with shorter and sparser pubescence. The clothing of the scutellum and elytra is very inconspicuous. The pronotum is coarsely rugose, well rounded at the sides and base, with very blunt hind angles, and the elytra are broad and not very convex.

Endoxazus elgonensis, sp. n.

Nigro-piceus, elytris pedibusque rufis, capite postice, pronoti margine postico pectoreque longe flavo-hirto ; elongato-ovatus, convexus, nitidus, clypeo quadrato, haud lato, parce punctato, marginibus reflexis, antico fere recto, vix exciso, fronte crebro punctato, antice utrinque excavato ; pronoto convexo, irregulariter, medio sparsius et minutius, punctato, lateribus medio angulatis, antrorsum convergentibus, postice fere parallelis, angulis posticis rectis, basi leviter trisinuato, scutello minute punctato, lateribus anguste opacis ; elytris irregulariter haud profunde punctatis, absque lineis aut costis, angulis apicalibus rotundatis ; pygidio convexo, lævi, parcissime punctato ; metasterno et coxa postica opacis, flavis ; pedibus longis, tibia antica lata, obtuse tridentata, tibiis 4 posterioribus extus dentatis :

♂, tibia intermedia valde arcuata, antennarum clava modice longa.

Long. 14 mm. ; lat. max. 7·5 mm.

Kenya : Mt. Elgon, 11,500 ft. (*F. W. Edwards*, Feb.). Three male specimens only were taken.

I have provisionally referred this and the following species to *Endoxazus* although they appear to differ considerably from the type-species, *E. conradti* Kolbe, which is unknown to me. They agree with it in the scarcely emarginate clypeus, with well reflexed front and side margins, the shape of the thorax, irregularly sculptured elytra, absence of a mesosternal process and strongly curved middle tibiæ of the male, but differ in the thickly hairy metasternum and hind coxæ, the longer tarsi and shorter antennal club of the male. These differences do not appear sufficient to exclude them from the genus. A second species, *E. kivuensis* Burgeon, which has been referred to it, evidently differs still more than *E. conradti* from those here described, but of it only females were found. Only males of the two forms here described are known. Both are smooth and shining, with the metasternum and hind coxæ opaque, as well as the scutellum in *E. kenyensis* and a very narrow marginal line upon that of *E. elgonensis*. The latter, although nearly related to *E. kenyensis*, is a less narrow-bodied species, with red elytra and without the grey markings upon the upper surface of *E. kenyensis*. The clypeus has the same rather narrow, parallel-sided shape, with a nearly straight front margin, the pronotum is of the same shape and has a similar scattered puncturation, but is without the posterior median groove, the scutellum is shining, except for the narrow lateral border, and the elytra are shining and shallowly, rather rugosely, punctured. The pygidium is smooth, very convex and feebly punctured. The legs are pale red or fulvous, all the tarsi (in the male) much longer than the tibiæ and the metasternum and hind coxæ clothed with long and dense tawny hairs. The forehead also bears long erect hairs, the punctures of the pronotum contain short inconspicuous ones and its hind margin has a conspicuous fringe in front of the scutellum.

Endoxazus kenyensis, sp. n.

Niger, nitidus, griseo-maculatus, pronoti margine basali et lineola mediana posticali, scutello toto, elytrorum utrinque vitta basali et duabus postmedianis pygidiique lateribus griseis, pedibus rufis, capite postice, pronoti margine basali pectoreque longe fulvo-hirtis; elongatus, nitidius, capite excavatus, parce punctatus, clypeo fere quadrato, marginibus antico et lateralibus fere rectis, reflexis; pronoto parce punctato, medio anguste sulcato, lateribus ante medium angulatis, antrorsum convergentibus, postice parallelis, angulis posticis rectis, basi leviter trisinuato; elytris irregulariter haud profunde punctatis, angulis apicalibus vix rotundatis, pygidii lateribus parce puntatis, medio lævi; metasterno et coxis posticis opacis, pedibus longis, tibia antica lata, breviter tridentata, tibiis 4 posterioribus extus dentatis:

♂, tibia intermedia valde arcuata, antennarum clava modice

Long. 13·5 mm.; lat. max. 7 mm.

Mt. Kenya, 8500–9700 ft. (*G. L. R. Hancock*, April). Four male specimens were taken.

This species is shining black, with yellow legs, the sternum and hind coxæ grey and opaque and clothed with long tawny hair and the upper surface decorated with a variable pattern formed of a grey or whitish chalky matter, covering the scutellum and (? usually) consisting of a spot behind each eye, a narrow basal margin to the pronotum and a short line in the posterior part of the median groove. a spot near the middle of the basal margin of each elytron, a median longitudinal line near the suture and two very short parallel ones between this and the outer margin. The sides of the pygidium also are of the same colour. In other respects the species agrees with *E. elgonensis*.

VIII.—*The Mesozoic Ganoid Fishes of the Genus* Pholidophorus *Agassiz*. By Sir ARTHUR SMITH WOODWARD, F.R.S.

THE genus *Pholidophorus* as formerly understood (7) seems now to have included several species which belong to distinct genera and even to distinct families. The preoperculum and cheek-plates have recently been observed in some of the small Triassic species which were originally referred to *Pholodophorus*, and they show that these fishes really belong to the more primitive family of Colobodontidæ or Perleididæ (2, 6). When better known the other Triassic species are likely to prove to be similarly primitive. The earliest species which seem to exhibit some of the essential characters of *Pholidophorus* are the small fishes from Rhætic formations, such as *P. higginsi* Egerton and *P. belgrandi* Priem (4). The osteology of their head, however, has not yet been sufficiently well observed.

Genus PHOLIDOPHORUS Agassiz.

The typical species of the genus *Pholidophorus* is *P. bechei* Agassiz (7) from the Lower Lias of Lyme Regis. It is a fusiform fish, with the back rounded in cross-section, and the ventral abdominal region also rounded but comparatively stout; the caudal pedicle is narrow, and the caudal fin deeply forked. The maxilla is gently arched, nearly uniform in depth throughout, and bears a row of minute conical or styliform teeth on its convex oral border. Similar teeth on the dentary bone of the lower jaw are slightly larger. The sensory canal on the cheek-plates and on the expanded angle of the preoperculum bears a few divergent branchlets. The suboperculum is relatively large and divided from the operculum by an oblique suture. All the fins are fringed with numerous minute fulcra, and the undivided bases of the rays in the dorsal and anal fins are long, stout, and smooth. The pectoral fins are a little larger than the pelvic pair. The dorsal and anal fins are triangular, only about as long as deep, and the depth of the dorsal equals about half the depth of the trunk at its insertion. The dorsal fin arises opposite to or just behind the pelvic fins. The scales are arranged in from 40 to 50 transverse rows, and those traversed by the lateral line in the anterior part of the abdominal region, besides those immediately below, are twice as deep as broad ; other principal flank scales are deeper than broad, but most of the scales are nearly equilateral, and a few at the ventral and dorsal borders of the caudal region are even broader than deep. The dorsal ridge scales are not larger than the scales just below them.

The generic characters are exhibited by several species ranging through European Jurassic formations, being as well marked in *P. macrocephalus* Agassiz from the Bavarian Lithographic Stone (1) as in the species from the Lias. One species (*P. obesus* Traquair), probably of the same genus, is also known from the Wealden of Bernissart, Belgium (5). The earliest species are more slender than the latest species, which are comparatively deep-bodied. It is therefore interesting to note that the Lower Jurassic *P. americanus* Eastman (3) from South Dakota, U.S.A., is likewise slender, while the Upper Jurassic *P. sinensis* A. S. Woodw., from North Shensi, China, is deeply fusiform.

Genus PHOLIDOPHOROIDES, novum.

One species from the Lower Lias, *P. crenulatus* Egerton, is distinguished from *Pholidophorus* by its smaller scales, which are less deepened on the flank. The scales are arranged in from 50 to 60 transverse rows, and those of the anterior part of the lateral line are less than twice as deep as broad. The scales are also comparatively thin, often displaying their concentric lines of growth. The fins are small like those of *Pholidophorus*. The maxilla seems to be comparatively stout. Ring vertebræ are conspicuous in the abdominal region.

P. crenulatus may therefore be regarded as the type-species of a distinct genus, *Pholidophoroides*. It was wrongly referred by Zittel (9) to *Isopholis*, of which the type-species is *Ophiopsis muensteri* Agassiz, from the Lithographic Stone of Bavaria. The Lower Liassic species, *P. caudalis* A. S. Woodw., probably also belongs to *Pholidophoroides*.

Genus PHOLIDOPHORISTION, novum.

A species from the English Middle Purbeck Beds, *P. ornatus* Agassiz, differs from *Pholidophorus* especially in the large size of the dorsal fin and the shape of the abdominal region. The maxilla is bent sharply upwards behind, but its tooth-bearing oral border is straight, and its anterior end is only slightly bent upwards to articulate with the postero-superior edge of the premaxilla. The triangular dorsal fin, though opposed to the pelvic pair, is unusually far forwards, and its depth about equals that of the trunk at its insertion. The ventral face of the abdominal region is very wide and flattened, bordered by a series of angularly bent scales. The scales are arranged in from 40 to 50 transverse rows, and those of the abdominal flank are deepened as in *Pholidophorus*; but the scales of the lateral line in the caudal region are traversed by a strong smooth keel.

With these characters, therefore, *P. ornatus* should be referred to a distinct genus, which may be named *Pholidophoristion* in allusion to the sail-like appearance of the dorsal fin. *P. micronyx* Agassiz, from the Lithographic Stone of Bavaria, evidently belongs to the same genus.

Genus ICHTHYOKENTEMA, novum.

Two more species from the English Purbeck Beds, *P. purbeckensis* Davies and *P. brevis* Davies, also seem to be wrongly referred to *Pholidophorus*. They are distinguished especially by the very large fulcra on the fins, and by the large size of the dorsal and anal fins and the scales. The triangular dorsal and anal fins are nearly equal in extent, the former being only a little deeper than the latter, and almost as deep as the greatest depth of the trunk. Each is fringed to the apex with only eight or nine large, deeply overlapping smooth fulcra. The scales are arranged in about 40 transverse rows, and those of the anterior part of the lateral line are remarkably deep, from three to four times as deep as broad. The scales immediately above and below those of the lateral line in this region are also somewhat deeper than broad.

The genus which these two species represent may be appropriately named *Ichthyokentema* (fish-goad). The so-called *Lepidotus sibiricus* Rohon (Mém. Acad. Imp. Sci. St. Pétersbourg, ser. 7, vol. xxxviii. no. 1, 1890, p. 9, pl. i. fig. 12; pl. ii. figs. 23, 24), from the Jurassic of Govt. Irkutsk, Siberia, belongs either to this or to a related genus.

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IX.—*The Head Shield of a new Macropetalichthyid Fish* (Notopetalichthys hillsi, *gen. et sp. nov.*) *from the Middle Devonian of Australia.* By Sir ARTHUR SMITH WOODWARD, F.R.S.

[Plate I.]

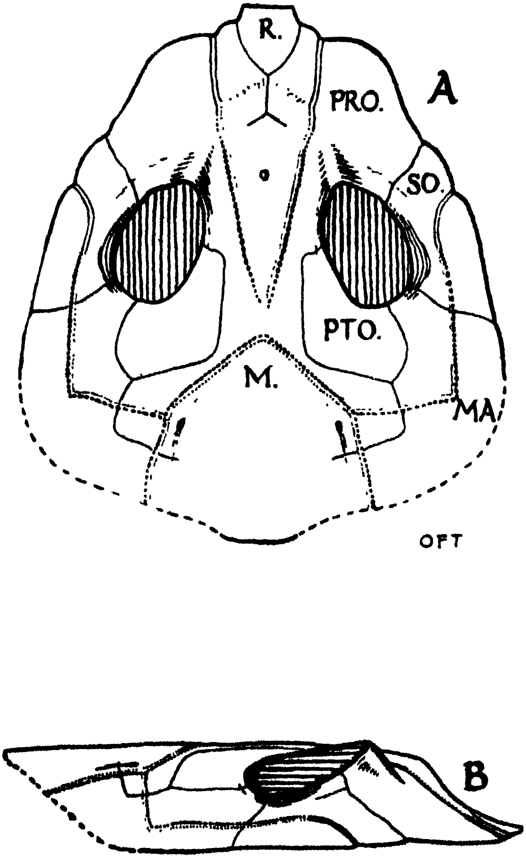
THE discovery of a Macropetalichthyid head shield in a Middle Devonian marine limestone in Australia is another example of the similar distribution of the Devonian fishes in the northern and southern hemispheres (3, 4). The fossil was found by Mr. J. A. Watt, B.Sc., in Goodra Vale, New South Wales, and I am indebted to the Director of the Geological Survey of New South Wales for the opportunity of studying the specimen. It is shown only very slightly enlarged in Pl. I.

The head shield lacks the left side from the front of the orbit backwards, and the right postero-lateral margin is a little broken. Otherwise it is complete, and it is especially interesting because it is almost uncrushed, only slightly distorted to the left. The anterior border of each orbit rises to the end of a short, laterally compressed ridge which is directed forwards and inwards, and the interorbital part of the cranial roof is flattened. Further back the sides of the roof incline gently downwards from a rounded longitudinal median ridge. In front of the orbits and the flattened interorbital roof the face inclines steeply downwards, with the lower rim curving forwards. The shape of the head is therefore much like that of the existing Cestraciont sharks, only it is less deep in proportion to its width. The ovoid orbits, with their long axis directed antero-posteriorly, are relatively large for a Macropetalichthyid, and the interorbital width scarcely, if at all, exceeds their longest diameter. The total length of the skull must have been nearly 1 cm., while the antero-posterior length of the orbit is about 22 mm.

The head shield is comparatively thin, the average thickness of the broken edges being not much more than a millimetre. The middle of the small preorbital ridge is double this thickness. The external surface is completely covered with small rounded tubercles which are nearly uniform in size and closely arranged, often in parallel and concentric lines which are more or less fused into ridges. Some of the concentric ridges in the slightly raised rim of the orbits are completely smooth. The large sensory canals are as usual conspicuous, but the sutures between the constituent plates are only in part quite clear. The opening of the ductus endolymphaticus is well seen far back on the right side, with a little smooth longitudinal streak in front and a narrower longitudinal groove behind it.

The small median rostral plate (*R.*) is a little longer than wide, and it tapers behind to a rounded end, which is on the steep face well below the flattened cranial roof.

The tubercles on its external surface are arranged in rows radiating from the front to the lateral borders and the hinder end. The pair of preorbital plates (*PRO.*) form the rest of the steep face, including the preorbital ridges.



Notopetalichthys hillsi, gen. et sp. n.

Diagram of head shield restored, with sutures partially shown, about threequarters nat. size, in upper (A) and right side view (B). Middle Devonian; Goodra Vale, New South Wales, Australia. *M.*, median plate; *MA.*, marginal; *PRO.*, preorbital; *PTO.*, postorbital; *R.*, rostral; *SO.*, suborbital. The side view differs from that of Pl. I. because the distortion has been corrected.

They meet for a short distance in the middle line behind the hinder end of the rostral plate, and seem to extend into the flattened roof as a narrow strip along the inner border of each orbit, thus meeting the pair of postorbital plates and excluding the long median plate from the orbital border. Most of the tubercles on the preorbital plates tend to fuse into ridges which are concentric with the external border, but those near the orbit are concentric with its border, while those at the median suture are transverse. The long median plate (*M.*) ends forwards in an angulated edge just in advance of the orbits, where the flattened roof bends into the steep face; and it extends backwards to the occipital border of the shield. It is evidently composite and seems to include the small pineal plate. At least between the preorbital ridges parallel rows of tubercles radiate outwards and forwards from an antero-posteriorly elongated median area which is ornamented with sparse longitudinal rows of tubercles, including one relatively large median tubercle where a foramen might be expected if the pineal organ pierced the shield. This tubercle is between the front end of the orbits. Behind the supposed pineal area the longitudinal rows of tubercles radiate forwards and laterally from a point just behind the acute angle of the V-shaped supraorbital sensory canal. Here the interorbital portion of the long median plate is still nearly flat, and its superficial tubercles are less distinctly fused into ridges. The median plate is widest in the postorbital region, and this portion which is nearly half of the total length, is raised in the median longitudinal line into a rounded ridge. In its front half this ridge is simple, but in its hinder half it widens and is traversed by a longitudinal median depression. The tubercles on the hinder portion of the median plate are arranged in rows which are chiefly concentric with the occipital border and are scarcely fused into ridges. The postorbital plate (*PTO.*) is wider than long, and seems to be produced at its antero-median angle to meet the narrow backward extension of the preorbital along the inner border of the orbit. Its superficial tubercles are only fused into ridges along the raised border of the orbit. The shape of the small plate further back, which is pierced by the ductus endolymphaticus, is uncertain. The limits of the suborbital (*SO.*) are distinct. It is least wide where it meets the preorbital in front, and widest at its hinder border, where its width somewhat exceeds that of the orbit. The superficial tubercles are fused into ridges both at the orbital and lateral borders. The marginal plate

(*MA.*), which is incomplete behind, is covered with tubercles which are not much fused into ridges except near the lateral border. It extends inwards to reach the border of the orbit, thus separating the suborbital and postorbital plates, as in *Macropetalichthys*.

The sensory canals are relatively broad, and are contained in tubes which for the greater part of their extent open at the surface in a single row of large, usually ovoid pores. For a short distance where these canals pass out at the antero-lateral margin of the shield they are closed and appear merely as smooth grooves. The V-shaped supraorbital canal is very conspicuous as usual, and begins behind at a point opposite the hinder end of the orbits. The cephalic extension of the main lateral line is united with its fellow by a sharply angulated commissure across the middle of the median plate a short distance behind the V-shaped supraorbital line. A lateral branch, as usual, connects it with the suborbital canal on the marginal and suborbital plates.

In the relatively large size of the orbits and the narrowness of the interorbital region, the new Australian fossil differs from all known Macropetalichthyid head shields except that of *Pseudopetalichthys* (1, 6), which is distinguished by the much more backward position of the angle of the V-shaped supraorbital sensory canal. In the shape of the snout the new fossil agrees with the only uncrushed Macropetalichthyid snout hitherto described (*M. scheii* Kiaer (5)) in the prominence of the orbits, the flatness of the interorbital region, and the steepness of the upper frontal profile. In the separation of the supraorbital sensory canal from the commissure of the cephalic lateral line it differs from *Macropetalichthys* and agrees with the Lower Devonian *Lunaspis* (2) and the Upper Devonian *Epipetalichthys* (7). In the shape of the occipital part of the median plate it most closely resembles *Lunaspis* (2). In the latter genus the fusion of the lines of superficial tubercles into concentric ridges is nearly complete.

The Middle Devonian head shield from Australia therefore belongs to a new genus, *Notopetalichthys*, characterized by the relative proportions of the snout, orbits, and interorbital space, the shape of the occipital part of the median plate, the single row of openings in the sensory canals, and the extent of the supraorbital canal. The type species, of which the head shield is here described in detail, may be named *N. hillsi*, in honour of Dr. Edwin Sherbon Hills, who has contributed so much to our knowledge of Australian Devonian fishes.

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EXPLANATION OF PLATE 1.

Notopetalichthys hillsi, gen. et sp. n.; head shield in upper (A) and right side view (B), about natural size. Middle Devonian; Goodra Vale, New South Wales, Australia.

X.—*New Species of* Chrysomelidæ (*Coleoptera*) *from New Guinea, Solomon Is. and Fiji.* By G. E. BRYANT, F.R.E.S. (Entomological Assistant, Imperial Institute of Entomology).

[All the types will be presented to the British Museum.]

EUMOLPINÆ.

Stethotes cœrulea, sp. n.

Metallic blue, the underside, legs, and five terminal segments of the antennæ black, the six basal segments of the antennæ flavous, prothorax punctured, the elytra strongly punctate-striate. L. 3 mm.

Head deep metallic blue, oblong and very convex, the front with a few strong punctures, the vertex and base with the punctures almost strigose. Antennæ slender, extending a little beyond the base of the elytra, the six basal segments flavous, the five terminal segments black, the two basal segments more dilated than the third to the sixth, which are slender and about equal, the five terminal thickened and about equal. Prothorax metallic blue, very convex, widest at its base, the sides rounded and contracted in front; somewhat strongly punctured, the punctures widely separated, but closer at the sides. Scutellum rather large, black, nitid, subtriangular. Elytra metallic blue, strongly punctate-striate, the punctures widely spaced, the shoulders prominent, the sides straight to behind the middle, thence gradually rounded to the apex. Legs black, all the femora with a strong tooth, the anterior femora rugosely punctured, the middle and posterior tibiæ strongly notched at their apex. Underside black.

New Guinea: Talasea, 6. xi. 1940 (*J. L. Froggatt*); 2 specimens. Feeding on *Solanum* sp.

Allied to *S. apicicornis*, Baly, from Aru Island, but differs in colour and the puncturation not nearly so close.

HALTICINÆ.

Eucycla leveri, sp. n.

Body rounded, strongly convex, head and prothorax black, elytra metallic purple, antennæ with the basal segments pale yellow. Legs fulvous, underside black. L. 3 mm.

Head black, the vertex smooth, impunctate, the inter-antennal space narrow. Antennæ in the male longer than female, extending slightly beyond the base of the prothorax, the six basal segments pale yellow, the first segment very long and club-shaped, equal in length to the four following together, the second thicker, but equal to the third, the third to sixth about equal, the seventh to tenth black, all about equal and slightly thickened, the eleventh pale yellow, longer than the tenth and pointed. Prothorax black, nitid, finely punctured, transverse, the sides contracted in front, the basal margin with a medium rounded lobe. Scutellum nitid, triangular. Elytra metallic purple, punctate-striate, the intervals smooth, marginal space broad and without striæ. Legs fulvous. Underside black, sparsely pubescent.

Solomon Islands: Tulagi, 3. viii. 1934 (*R. A. Lever*); 1 ♂, 2 ♀♀.

Allied to *E. violacea*, Chen, from Larat Island, but differs in the prothorax not so broad and more contracted in front, and the colour of the antennal segments different.

Arsipoda salomonensis, sp. n.

Oblong-ovate, below piceous, above metallic dark green or coppery, the antennæ, palpi, labrum and the four anterior legs fulvous, head and prothorax irregularly and not strongly punctured; elytra punctate-striate, the interstices slightly costate towards the apex. L. 2–2·50 mm.

♂ and ♀.—Head metallic dark green, irregularly and rather feebly punctured, the eyes large but not prominent, labrum and palpi fulvous, the antennæ fulvous, inserted close together, extending a little beyond the base of the elytra, the two basal segments thickened, the third to the seventh more slender and about equal to each other, the terminal segments gradually thickened. Prothorax metallic dark green, transverse, the sides straight and margined, narrowed in front, the anterior angles oblique, the surface finely and somewhat irregularly punctured, a sinuate narrow feeble impression at the base, terminated at each end by a longitudinal sulcus. Scutellum dark metallic green, impunctate. Elytra dark metallic green, punctate-striate, the punctures stronger than on the prothorax, the interstices slightly costate towards the apex. The four anterior legs fulvous, the posterior femora incrassate and fuscous, clothed with short scattered pubescence, the hind tibiæ fulvous, slightly curved and notched at their apex. Underside piceous, the first ventral segment very long, all the ventral segments clothed with short scattered pubescence. ♂ smaller than ♀.

Solomon Is.: San Cristobal, Kirakira, 9. v. 1945 (*R. A. Lever*), 19 specimens; Guadalcanal, 31. viii. 1934 (*H. T. Pagden*), 2 specimens, on *Colocasia*.

Allied to *A. parvula* Jac.=*A. consanguinea* Blk., from N. Queensland, but differs in its darker colour, the punctuation of the elytra finer and the interstices of the striæ less costate.

A. tenimberensis Jac. (*Chætocnema*), *A. costipennis* Baly (*Crepidodera*). All these species, which have been described in three different genera, are very closely allied.

Podagrica froggatti, sp. n.

Ovate, convex, pointed behind, colour deep blue, the four basal segments of the antennæ fulvous, the sides of the elytra strongly costate. L. 5 mm.

Head dark blue, irregularly punctured between the eyes, the basal portion impunctate. Antennæ extending slightly beyond the base of the prothorax, the four basal segments fulvous, the remainder black, the first very long and club-shaped, the second shorter and about equal to the third and fourth, the fifth to the apical slightly thickened and pubescent. Prothorax deep blue, very transverse, the sides rounded and slightly contracted in front, feebly margined, the anterior angles distinct, very finely and not closely punctured, on each side of the front margin a short longitudinal depression. Scutellum triangular, smooth and impunctate. Elytra deep blue, the sides rounded and behind the middle tapering and almost pointed, the sides feebly margined and with well-defined costæ becoming strongest at the side, very finely punctured, forming irregular double rows. Legs black, the posterior pair clothed with thick golden pubescence towards the apex. Underside black, clothed with very short ashy pubescence, the first ventral segment twice as long as the second, the second to the fourth about equal, the apical segment strongly notched in the male.

New Guinea : Huon Gulf, Morobe District, 22. v. 1937 (*J. L. Froggatt*) ; 1 specimen.

New Guinea : Kokoda, vi. 1933, 1200 ft. (*Miss L. E. Cheesman*) ; 1 specimen.

This species is a very striking one on account of its entirely blue colour and costate elytra, and *P. tarsata* Baly, from New Guinea only approaches it in size.

Podagrica basselæ, sp. n.

Body oblong, parallel-sided, rounded behind, fulvous, elytra metallic blue, the six apical segments of the antennæ black, the ventral segments of the abdomen fuscous. L. 3·50 mm.

Head fulvous, the vertex convex and impunctate, antennæ extending beyond the base of the elytra, the five basal segments fulvous, the six apical black, the first segment much thickened, twice as long as the second, the second shorter but thicker than the third, the fourth and fifth about equal, each a little shorter than the third ; the remainder thickened, pubescent, and about equal to each other. Prothorax fulvous, transverse, very finely and not closely punctured, the sides slightly rounded, the anterior angles oblique and thickened, the posterior margin having on either side near the hind angle a deep short perpendicular impression, while behind the eyes on the anterior margin a very short perpendicular impression. Scutellum small, impunctate, triangular. Elytra metallic blue, slightly broader than the base of the prothorax, nearly parallel-sided, gradually rounded to the apex, finely punctate-striate, in irregular double rows, the intervals between the striæ at the sides slightly costate. Legs fulvous. Male with the first segment of the anterior tarsus dilated. Underside fulvous, the ventral segments of the abdomen fuscous.

New Guinea: Huon Gulf, Morobe District, 22. vi.–19. vi. 1937 (*J. L. Froggatt*); 5 specimens. Reported feeding on the foliage of *Bassela* sp.

Allied to *P. striatipennis*, Jac., from India, but differs in the much finer double punctate striæ of the elytra.

Crepidodera salomonis, sp. n.

Subelongate, convex, metallic blue, the abdomen black, antennæ and palpi fulvous, the basal and five terminal segments tinged with fuscous, legs fulvous, the posterior femora black. L. 2 mm.

Head metallic blue, impunctate, a longitudinal carina between the insertion of the antennæ, eyes round and somewhat prominent. Antennæ extending well beyond the base of the elytra, the two basal segments more swollen, the first nearly twice as long as the second, tinged with fuscous, the third to the sixth more slender and each a little longer than the second, fulvous, the five terminal segments all about equal to each other, more dilated and fuscous. Prothorax metallic blue, finely and rather closely punctured, transverse, the sides margined and slightly contracted in front, the anterior angles obliquely truncate, a transverse basal impression. Scutellum metallic blue, impunctate, subtriangular. Elytra metallic blue, slightly wider than the base of the prothorax, the sides almost straight, and rounded at the apex, punctate-striate, the punctures not very close together, stronger than on the prothorax. Legs fulvous, the middle and posterior tibiæ tinged with fuscous, the posterior femora black. Underside metallic blue, except the ventral segments of the abdomen, which are black, the first segment twice as long as the second, the second to the fourth about equal. Male with the first segment of the anterior tarsi more dilated.

British Solomon Islands: xi. 1931 (*R. J. A. W. Lever*); 2 specimens.

Somewhat allied to *C. cœruleata* Baly and *C. indicica* Blkb. from Australia, but smaller and the puncturation of the elytra different.

Psylliodes fulvipes, sp. n.

Elongate ovate, convex, metallic blue-green, the underside, the three basal segments of the antennæ, and the legs fulvous. L. 2·50 mm.

Head metallic blue-green, impunctate, a small round impression between the eyes, the antennæ long and slender, extending to the middle of the elytra, the three basal segments fulvous, each long and slender, about equal to each other, the seven terminal segments black, all about equal and slightly thickened. Prothorax metallic blue-green, slightly transverse, widest at the base, narrowing slightly in front, the anterior angles obliquely truncate, finely but not closely punctured. Scutellum small triangular, black, impunctate. Elytra metallic blue-green, broader than the base of the prothorax, widest at the middle, thence tapering and rounded to the apex, finely punctate-striate; all the legs bright fulvous, the male with the first segment of the anterior tarsi dilated. Underside fulvous, the first ventral segment of the abdomen longer than the second, and about equal to the fifth, the second to the fourth much shorter and about equal to each other; irregularly punctured.

New Britain: Rabaul, 16. xii. 1940 (*J. L. Froggatt*); 3 specimens.

Somewhat allied to *P. novæ-caledoniæ* Baly.

Psylliodes solani, sp. n.

Elongate ovate, convex, metallic purple, the underside black, the antennæ with the five basal segments fulvous, the five terminal segments black, the legs fulvous, except the posterior femora, which are metallic purple. L. 3–3·50 mm.

Head metallic purple, very finely punctured, a transverse shallow impression between the eyes, the labrum black. Antennæ extending not quite to the middle of the elytra, the five basal segments fulvous, all about equal, the five terminal segments black, pubescent, slightly thickened, all about equal. Prothorax metallic purple, strongly punctured, transverse, widest at the base, the sides slightly rounded, narrowed in front, the anterior angles obliquely truncate. Scutellum dark purple, triangular, impunctate. Elytra metallic purple, broader than the prothorax, rounded at the shoulders, broadest before the middle, gradually narrowing at the apex, finely punctate-striate, the intervals smooth. Legs fulvous, with the exception of the posterior femora, which are metallic purple; the hind tibiæ toothed at the apex. Underside black, the ventral segments of the abdomen somewhat closely punctured and pubescent, the first segment the longest, the apical segment strongly notched in the male.

New Britain: Rabul, 24. viii. 1934 (*J. L. Froggatt*); 2 specimens. On foliage of *Solanum* sp.

Allied to *P. malaisei* Bry., from Burma, but smaller and colour of legs different.

GALERUCINÆ.

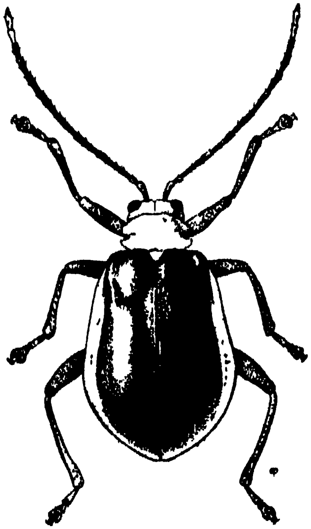
DRASA, n. n. pro *Sarda* Baly, 1863, nec Lacépède, 1832.

Drasa tibialis, sp. n. (Fig. 1.)

Ovate, moderately convex, flavous, nitid, antennæ black, with the two basal segments fulvous, the two terminal segments flavous, elytra blue black, margined with flavous, legs flavous, all the tibiæ with their outer margin black. L. 8 mm.

Head flavous, nitid, impunctate, the front perpendicular, a longitudinal median impression on the basal part. Antennæ long and slender, extending to the apex of the elytra, black, with the two basal segments fulvous, and the two apical segments flavous, the first segment slightly curved, dilated at the apex, the second very short and rounded, the third elongate, longer than the first or third, the fourth to the seventh about equal, each a third shorter than the third, the eighth to the eleventh each slightly shorter than the seventh, the tip of the apical segment tinged with fuscous. Prothorax flavous, nitid, transverse, very narrow in relation to the base of the elytra, and very little wider than the head, the sides nearly parallel, the anterior angles acute, the posterior angles produced in a tubercle, and a small tubercle in the angle. Scutellum flavous, nitid, impunctate triangular. Elytra blue, margined with flavous, the suture with the basal two-thirds margined with flavous, the side margins strongly explanate, containing strong punctures, the sutural margin also strongly punctured, the basal portion of the surface with a few fine punctures, the basal half depressed behind the shoulders. Legs flavous, all the tibiæ with their outer margin black, clothed with fine pubescence. Underside entirely flavous, the ventral segments of the abdomen rugosely punctured.

Fig. 1.



Drasa tibialis, sp. n.

Solomon Islands: Guadalcanal, Popanu, 11. xii. 1934, 500 ft. (*R. A. Lever*), 7 specimens; Bougainville Island: Kieta, 31. v. 1934, x. 1937 (*J. L. Froggatt*), 2 specimens.

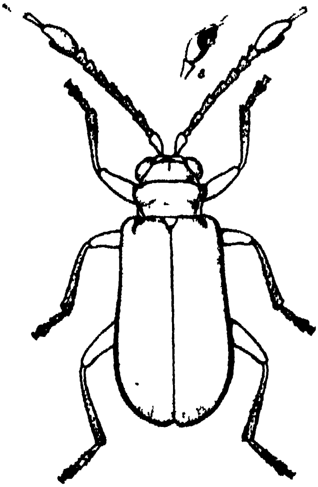
Allied to *Sarda tetraspilota* Baly, from the New Hebrides, but differs in colour, and having no pattern on the elytra. The two specimens from Bougainville differ slightly in not having the sutural margin so strongly punctured.

Cerophysa vitiensis, sp. n. (Fig. 2.)

Fulvous, except for the elytra, black, and the nine terminal segments of the antennæ fuscous, the male with the ninth antennal segment enormously dilated, the female with the antennæ simple, head impunctate, prothorax and elytra very finely punctured. L. 6–6·5 mm.

Head fulvous, impunctate, a transverse impression behind the insertion of the antennæ, a short median longitudinal carina in front. Antennæ extending to the middle of the elytra, the two basal segments fulvous, the remainder fuscous. Male with the first segment long and swollen, the second very short and rounded, the third four times as long as the second, the fourth to the sixth about equal to each other and a little shorter than the third, the seventh and eighth each increasing in width, the ninth enormously dilated, deeply excavated below, its margin dentate, the tenth and eleventh long and slender, the eleventh a third longer than the tenth. Female with all the segments simple. Prothorax fulvous, very finely punctured, widest in front, contracted at its base, the sides feebly margined, the upper surface with a rather deep transverse impression, a little behind the middle. Scutellum fulvous, impunctate, triangular. Elytra black, nitid, very finely and irregularly punctured, gradually

Fig. 2.



Cerophysa vitiensis, sp. n.

broadening from the base to the apex, the apex rounded. Legs fulvous. Underside fulvous, the sternum impunctate, the ventral segments of the abdomen somewhat rugosely punctured.

Fiji Islands : Tamavua, 7. vi. 1927 (*H. W. Simmonds*) ; 3 ♂♂, 2 ♀♀.

The first species to be described from this region. Somewhat allied in colour to *C. fulvicollis* Jac., from Burma, but the male with the ninth segment of the antennæ, instead of the eighth, dilated.

XI.—*New or little-known* Tipulidæ (*Diptera*).—LIX. *Neotropical Species*. By Charles P. Alexander, Ph.D., F.R.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A.

The crane-flies discussed herewith are all from Ecuador, with the exception of a single species from Argentina that has been incorporated for comparison with one of the Ecuadorean forms. As in recent parts under this general title, the present material was collected by William Clarke-MacIntyre, aided by native assistants. My great indebtedness to Mr. MacIntyre is expressed for his efforts in making known the very rich Tipulid fauna of Ecuador.

Tanypremna (*Tanypremna*) *picturella*, sp. n.

General coloration of mesonotal præscutum castaneous, the cephalic and humeral portions intensely black ; pleura uniform orange-yellow, scarcely patterned ; all tibiæ and tarsi black ; wings pale yellow, heavily patterned with brown ; cell *1st* M_2 relatively large, *m–cu* at near two-thirds the length of M_{3+4} ; petiole of cell M_1 longer than *m* ; basal abdominal tergites obscure brownish yellow, ringed with brownish black on posterior portion ; outer segments uniformly blackened, the hypopygium more yellowish.

Male.—Length about 11 mm. ; wing 11 mm. ; antennæ 1·3 mm.

Frontal prolongation of head yellow above, more pruinose on sides beneath ; nasus short, tufted with long black setæ ; palpi black throughout. Antennæ very short, as usual in the subgenus ; scape and pedicel pale yellow, flagellum uniformly black ; flagellar segments soon passing into elongate. Head with anterior vertex clear orange-yellow, the posterior vertex infuscated; vertical tubercle high, the summit weakly emarginate.

Pronotum obscure yellow, restrictedly darkened medially. Mesonotal præscutum with the disk covered by a castaneous shield, the usual stripes confluent; cephalic and humeral portions of sclerite intense black, the lateral borders before suture less evidently darkened; scutum conspicuously blackened; posterior sclerites of notum brownish yellow, the mediotergite slightly darker; pleurotergite yellow; præscutum glabrous. Pleura uniformly orange-yellow, only the ventral sternopleurite a trifle darker. Halteres yellow, the apex of stem weakly darkened. Legs with the coxæ and trochanters yellow, the posterior pair slightly more testaceous; femora brown, more brightened at base, the tip narrowly blackened; all tibiæ and tarsi black. Wings with the restricted ground-colour pale yellowish subhyaline, the disk heavily patterned with brown; cells *C* and *Sc* uniformly darkened; stigma brown; cord and outer end of cell 1*st* M_2 seamed with brown, the margins diffuse; all veins beyond cord broadly and diffusely margined with brown, restricting the ground to pale centres to the cells; a pale brown cross-band before mid-length of wing, crossing cells *R* and *M* just beyond mid-length, widened behind in cells *Cu* and 1*st A*, including the entire outer end of the latter cell; margins of cells *2nd A* and the narrowly open *Cu* similarly clouded; a small postarcular cloud in bases of cells *R* and *M*; prearcular field chiefly pale; veins pale, a little darker in the patterned areas. Venation: Sc_2 ending opposite *r–m*; *Rs* of moderate length, arcuated at origin; cell 1*st* M_2 relatively large; *m–cu* at near two-thirds the length of M_{3+4}; petiole of cell M_1 longer than *m*.

Basal abdominal segments obscure brownish yellow on proximal rings, brownish black on posterior portions; fourth and succeeding segments almost uniformly blackened; basal sternites uniformly yellow, the outer segments darkened; hypopygium more yellowish. Male hypopygium with the basistyle not produced, the dististyles apical in position. Outer dististyle relatively wide, entirely pale, with long coarse, chiefly marginal setæ. Inner dististyle broadly flattened, pale, the beak relatively long, blade-like; outer margin of style with a series of from eight to ten curved black spines, irregularly spaced, extending to the base of the rostrum, the more basal spines a little shorter than the outer ones.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1200 metres, May 26, 1939 (*MacIntyre*).

Tanypremna (Tanypremna) picturella is readily told from all other species with uniformly blackened tarsi by the patterned wings.

Holorusia vivida, sp. n. (Fig. 1.)

General coloration of notum brown, the præscutum with four more reddish-brown stripes; antennæ (male) relatively long, basal flagellar segments weakly bicoloured; pleura yellow; wings with centre of disk whitish subhyaline, the remainder of the ground-colour strongly infuscated; a heavier brown pattern, including areas beyond arculus; at origin of *Rs*; cord and at mid-length of cell *M*; cell R_3 strongly constricted at mid-length; *m–cu* before fork of M_{3+4}; male hypopygium with the outer dististyle elongate, abruptly narrowed on distal third.

Male.—Length about 15 mm.; wing 17·5 mm.; antennæ about 4·6 mm.

Female.—Length about 18 mm.; wing 18 mm.

Frontal prolongation of head light brown; nasus distinct; palpi black, the terminal segment paling to obscure brownish yellow. Antennæ with scape and pedicel yellow; basal flagellar segments weakly bicoloured, black basally, the tips restrictedly brightened; eighth and succeeding segments uniformly blackened; flagellar segments cylindrical, the terminal segment abruptly reduced in length and diameter. Head brown, the vertex vaguely darkened medially.

Mesonotum brown, the præscutum with four more reddish-brown stripes that are poorly differentiated against the ground; scutum darkened medially, the lobes slightly brightened; scutellum chiefly dark brown, the parascutella a little paler; mediotergite pale brown, fading to yellow on posterior portion, the central area with indications of a capillary brown vitta; mesonotum rather abundantly covered with short golden yellow setæ that are lacking on the præscutal stripes. In female, the præscutal stripes more pruinose. Pleura uniformly pale yellow, the pleurotergite more blackened on its ventral portion, longitudinally ribbed. Halteres with stem obscure brownish yellow, restrictedly brightened at base, the knob infuscated. Legs with coxæ and trochanters yellow; femora obscure yellow, the tips rather narrowly and weakly darkened; tibiæ and tarsi obscure yellow to brownish yellow. Wings with the centre of disk, including cell M and adjoining portions of cells R and R_1, whitish subhyaline, the remainder of ground strongly infuscated, including all cells beyond cord, but especially the outer radial field; conspicuous darker brown areas, as follows:—Postarcular in bases of cells R and M; origin of Rs; seams on anterior and posterior cords, interrupted at M_{1+2}; a conspicuous area in cell M adjoining vein Cu, at near mid-length of cell; stigma dark brown; cell Sc uniformly dark brown, C more brownish yellow; veins dark brown. Venation: Rs relatively long, nearly twice the length of m–cu; cell R_3 strongly constricted at mid-length, the adjoining veins, especially R_{4+5}, strongly sinuous; cell 1st M_2 relatively long: m–cu before fork of M_{3+4}.

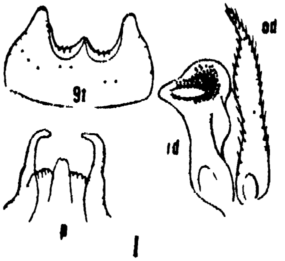


Fig. 1.—*Holorusia invida*, sp. n.

Male hypopygium, details. Symbols: *id*, inner dististyle; *od*, outer dististyle; *p*, phallosome; *t*, 9th tergite.

Abdomen obscure brownish yellow, trivittate with dark brown, this colour likewise including the posterior borders of the segments; sternites more uniformly brightened; subterminal segments more uniformly dark brown; hypopygium chiefly obscure yellow. Male hypopygium (fig. 1) with the tergite, 9*t*, transverse, the caudal margin deeply and broadly emarginate, the border thickened and medially produced into a short lobe. Dististyles, *id*, *od*, as figured, the outer elongate, abruptly narrowed on distal third; inner style with more than apical half dilated into a head, the beak very short and obtuse.

Hab. Ecuador.

Holotype, ♂, Baños, altitude 1700 metres, May 12, 1939 (*MacIntyre*). *Allotype*, ♀, Abitagua, Oriente, altitude 1200 metres, April 4, 1937 (*MacIntyre*).

Holorusia vivida is quite different from other regional species. In the conspicuously patterned wings, it somewhat resembles *H. sinuosa* Alexander and related forms, but the pattern of the wings and body, as well as the venation, are quite distinct.

Tipula effulta, sp. n. (Fig. 2.)

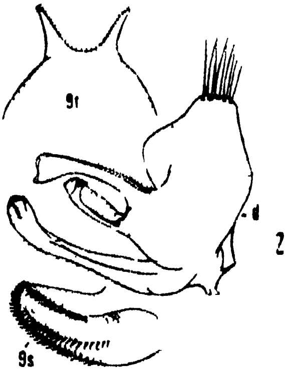
Allied to *parishi*; general coloration brownish yellow, the præscutum with scarcely differentiated stripes; antennæ of moderate length, the basal flagellar segments bicoloured; wings greyish subhyaline, cells *C* and *Sc* darker brown; a sparse brown wing-pattern; *Rs* subequal in length to *m–cu*; abdomen yellow, the subterminal segments blackened; hypopygium chiefly yellow; caudal margin of tergite with two slender divergent lobes; dististyle with unusually long and slender lobes; ninth sternite with a setiferous brush-like lobe in notch; eighth sternite long and sheathing, the margin fringed with long reddish setæ.

Male.—Length about 11 mm.; wing 12–12·5 mm.; antennæ about 4 mm.

Female.—Length about 14 mm.; wing 13 mm.

Frontal prolongation of head brownish yellow, relatively short; nasus distinct; palpi pale brown. Antennæ (male) of moderate length; basal three segments yellow; succeeding segments bicoloured, black, with about the distal half of each yellow, the outer segments uniformly blackened; basal enlargements of segments poorly developed; verticils a trifle shorter than the segments; terminal segment elongate-conical. Head pale brown.

Pronotum brownish yellow. Mesonotum uniform brownish yellow, the præscutum with very poorly differentiated darker markings, the præscutal interspaces indicated chiefly by microscopic setulæ. Pleura yellow. Halteres pale brown. Legs with coxæ and trochanters yellow; femora obscure yellow; tibiæ brownish yellow, darker at tips; tarsi brown; claws small, simple. Wings greyish subhyaline, cells *C* and *Sc* abruptly dark brown; prearcular field only weakly infumed; stigma oval, brown; wing-tip weakly darkened; cord, outer end of cell *1st* M_2 and the medial veins beyond the latter very insensibly bordered by brown; veins brown. Venation: *Rs* arcuated, subequal in length to the long *m–cu*; R_{1+2} entire; petiole of cell M_1 nearly twice the length of *m*; *m–cu* before fork of M_{3+4}; cell *2nd A* wide.



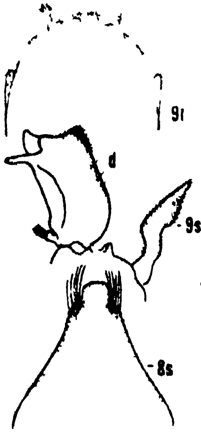


Fig. 2.—*Tipula effulta*, sp. n. Male hypopygium, details.
Fig. 3.—*Tipula prolixisterna*, sp. n. Male hypopygium, details.
Symbols: *d*, dististyle; *8s*, eighth sternite; *9s*, lobe of ninth sternite, *t*, 9th tergite.

Abdominal tergites yellow, the outer segments more darkened, especially laterally; subterminal segments, including six and seven, with basal half of sternite eight, black; eighth tergite brown; remainder of hypopygium yellow; sternites, except as described, obscure yellow. Male hypopygium (fig. 2) with the tergite, *9t*, terminating in two slender, divergent lobes that are separated by a wide U-shaped median notch. Dististyles, *d*, with the lobes unusually long and slender. Lobe at base of sternite, *9s*, a short compact structure, the surface set with abundant reddish setæ and spines to produce a brush-like organ, the upper portion further produced into a long pale lobe (not shown in figure). Eighth sternite long and sheathing, the caudal margin gently convex to subtruncate, the margin on either side of mid-line with a fringe of long reddish setæ.

Hab. Ecuador.

Holotype, ♂, Rio Blanco, near Baños, altitude 1600 metres, October 5, 1936 (*MacIntyre*). *Allotopotype*, ♀. *Paratopotype*, 1 ♂ with type; 1 ♂, altitude 1700 metres, August 15, 1937.

Tipula effulta is allied to *T. urophora* Alexander, *T. trinitatis* Alexander, and similar species, differing conspicuously in the structure of the male hypopygium. There appear to be a very great number of species of the group distributed throughout Tropical America.

Tipula prolixisterna, sp. n. (Fig. 3.)

Allied to *parishi*; general coloration greyish brown, the præscutal stripes scarcely differentiated; antennæ (male) relatively long, about one-half the length of wing, flagellum black; wings with a strong brown tinge, stigma and wing-base darker brown; cell *2nd A* moderately wide; male hypopygium with the caudal margin of ninth tergite produced medially, tufted with black spinous setæ; on either side of median lobe with a slender lateral lobe that is tufted with black setæ; lobe of ninth sternite a simple, strongly sinuous, pale rod, the surface with pale setulæ; eighth sternite very long and sheathing, narrowed outwardly, at apex further produced into a suboval median lobe.

Male.—Length about 10 mm.; wing 10·5 mm.; antennæ about 5·5 mm.

Female.—Length about 12·5 mm.; wing 12 mm.

Frontal prolongation of head brownish yellow; nasus stout; palpi black. Antennæ (male) relatively long, approximately one-half the length of wing; scape and pedicel yellow, flagellum black; flagellar segments elongate, moderately incised; verticils much shorter than the segments. Head medium brown with a scarcely developed verticel tubercle; setæ of orbits black, conspicuous.

Mesonotum almost uniform greyish brown, the præscutal stripes scarcely differentiated. Pleura more testaceous yellow. Halteres blackened. Legs with the coxæ testaceous yellow; trochanters yellow; femora yellowish brown; tibiæ brown; tarsi black; legs long and slender, as in the group. Wings with a strong brown tinge, cell *Sc* darker; stigma and wing base still darker brown; veins brown. Venation: *Rs* gently arcuated, subequal to *m–cu*; cell *2nd A* moderately wide.

Abdominal tergites dark brown, the sternites a trifle brighter; male with a black subterminal ring on segments seven and eight; hypopygium, including all but the darkened base of the elongate eighth sternite, yellow. In the female, abdomen chiefly darkened, vaguely patterned with obscure yellow; ovipositor with the genital segment yellow, the valves yellow; cerci beyond their bases strongly infuscated. Male hypopygium (fig. 3) with the ninth tergite, *9t*, a little longer than broad, the outer lateral angles rounded; median area of apical margin produced into a low transverse lobe set apically with abundant black spinous setæ; on either side of median lobe, arising from just behind the tergal margin, a slender lobe that bears numerous short black setæ, chiefly clustered at apex; lateral margin of tergite at near midlength bearing a low lobe. Diststyle, *d*, small and compact; rostrum slender; outer portion of style with abundant silken setæ. Lobe of notch of ninth sternite, *9s*, a simple, strongly sinuous, pale rod, the apex subacute, the surface with abundant pale setulæ. Eighth sternite, *8s*, unusually long and sheathing, at base very broad, the width at this point subequal to the total length, gradually narrowed outwardly; apex subtruncate and bearing an additional suboval or subquadrate median lobe, subtended on either side by long curved setæ.

Hab. Ecuador (Oriente).

Holotype, ♂, Jatun Yacu, altitude 700 metres, March, 1937 (*MacIntyre*). *Allotopotype*, ♀.

Tipula prolixisterna is quite different from the now numerous species of the *parishi* group in Tropical America, the chief specific distinctions lying in the structure of the male hypopygium.

Tipula lenta, sp. n. (Fig. 4.)

Allied to *parishi*; general coloration reddish brown, the præscutum with four very poorly differentiated, more yellowish-brown stripes ; antennæ (male) elongate, basal flagellar segments very weakly bicoloured, black, with their tips narrowly pale ; wings with a brown tinge, the costal border and stigma darker brown ; cell *2nd A* relatively wide ; abdomen obscure yellow, with a blackened subterminal ring ; male hypopygium with the ninth tergite relatively small, suborbicular in outline, the sides sloping to the very slender sublateral lobes, the latter subtending a broad median lobe ; eighth sternite relatively short but sheathing, the caudal margin deeply incised medially.

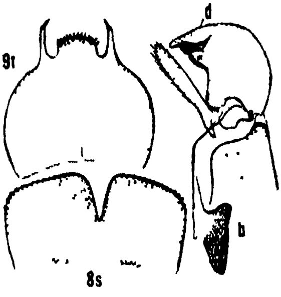
Male.—Length about 14 mm. ; wing 13·2 mm. ; antennæ about 6 mm.

Female.—Length about 15 mm. ; wing 12·5 mm.

Frontal prolongation of head brownish yellow ; nasus distinct ; palpi brown. Antennæ (male) relatively long, as shown by the measurements ; basal three segments yellow ; succeeding segments very weakly bicoloured, black with the extreme apices pale, on the fifth or sixth flagellar segment becoming uniformly black ; flagellar segments weakly incised, the longest verticils a little shorter than the segments. Head brownish yellow to pale brown, brighter in front ; anterior vertex with a median darker vitta ; orbits and sides of the scarcely developed tubercle with strong black setæ.

Mesonotal præscutum deep reddish brown, with four very poorly differentiated, more yellowish brown stripes ; posterior sclerites of the notum reddish brown, without evident pattern. Pleura and pleuro-tergite uniformly pale yellow. Halteres dark brown. Legs with coxæ and trochanters very pale yellow ; femora obscure yellow, the tips very weakly darkened ; tibiæ pale yellowish brown, the tips narrowly blackened ; tarsi black. Wings with a brownish tinge ; prearcular field, cells *C* and *Sc*, and the stigma darker brown ; obliterative areas very small and restricted ; veins brown. Venation : *Rs* a little longer than *m–cu* ; R_{1+2} entire and strong ; cell *2nd A* moderately wide.

Abdominal tergites obscure yellow, narrowly darkened laterally ; sternites more uniformly yellow ; a subterminal black ring including segment seven and caudal portion of sixth tergite ; eighth tergite yellow, narrowly blackened medially ; eighth sternite yellow, blackened at base ; remainder of hypopygium yellow. Male hypopygium (fig. 4) with the ninth tergite, 9*t*, relatively small, suborbicular in outline, the sides sloping to the sublateral lobes, the latter very slender, each tipped with a single spinous seta; median area of tergite produced, set with about twenty blackened spinous setæ. Basistyle, *b*, relatively short, with the usual pair of blackened plates on mesal face near base. Dististyles, *d*, as shown; outer dististyle small; lobes of inner dististyle short. Eighth sternite, 8*s*, relatively short but sheathing, the caudal border deeply notched medially; lateral lobes broad and obtuse, provided with abundant but relatively short yellow setæ; outer lateral angles of lobes with much longer, stronger setæ. Ovipositor with cerci relatively slender, sclerotized, compressed-flattened, with obtuse tips; hypovalvæ shorter, blackened outwardly, the tips truncate.



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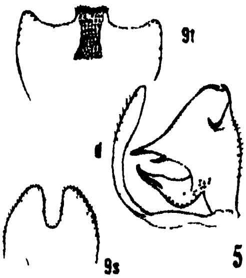

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Fig. 4.—*Tipula lenta*, sp. n. Male hypopygium, details.
Fig. 5.—*Tipula sternohirsuta*, sp. n. Male hypopygium, details.
Symbols: *b*, lobe of basistyle; *d*, dististyle; 8*s*, eighth sternite; 9*s*, lobe of ninth sternite; *t*, 9th tergite.

Hab. Ecuador (Los Rios).

Holotype, ♂, Playas de Montalvo, altitude 15 metres, March 3, 1938 (*MacIntyre*). *Allotopotype*, ♀, pinned with type.

Tipula lenta is quite distinct from other generally similar members of the group. As is the case with all the species so far described, the male hypopygium furnishes the most distinctive characters. The nearest allies are the various members of the group described at this time, especially *T. infida*, sp. n., and *T. icasta*, sp. n.

Tipula sternohirsuta, sp. n. (Fig. 5.)

Allied to *parishi*; general coloration dark brownish grey, the præscutum with scarcely indicated darker stripes; antennæ (male) elongate; flagellar segments bicoloured, the bases broadly black, the apices yellow; wings greyish, the costal border yellowish brown; wings with a restricted dark pattern, centres of cell R_5 and outer medial cells weakly darkened; cell *2nd A* relatively wide; abdomen yellow, with a brownish-black subterminal ring; eighth sternite with a conspicuous group of long erect setæ; median area of ninth tergite produced into a broad median lobe that is densely set with blackened spinous points; lobe of notch of ninth sternite a broadly depressed plate, bilobed by a deep U-shaped median notch.

Male.—Length about 14 mm.; wing 11·5 mm.; antennæ about 5·8 mm.

Female.—Length about 14 mm.; wing 12·5 mm.

Frontal prolongation of head buffy brown; nasus short; palpi brown, the basal segments paler. Antennæ of male elongate; basal three segments yellow; succeeding segments bicoloured, black, with the narrow tips yellow; on the fourth segment the latter colour including not more than the outer fourth or fifth of the segment; on outer segments the amount of yellow further decreases until on the eighth flagellar segment it is barely indicated; outer three flagellar segments uniformly blackened; flagellar segments only moderately incised, the basal enlargements very small; verticils much shorter than the segments; terminal segment reduced. Head brownish grey.

Pronotum and mesonotum dark brownish grey, the præscutum with scarcely indicated darker stripes. Pleura more yellowish, sparsely pruinose. Halteres with stem yellowish brown, the knob darker. Legs with the coxæ and trochanters obscure yellow; remainder of legs broken. Wings with the ground-colour greyish; prearcular field and cells *C* and *Sc* strongly yellowish brown; stigma oval, brown; anterior and posterior cords, together with the outer medial branches, narrowly seamed with brown; cell R_5 and outer medial cells with feebly darkened centres; veins brown. Venation: *Rs* a little longer than *m–cu*; R_{1+2} entire; M_{3+4} only about one-half the basal section of M_{1+2}; cell *2nd A* relatively wide.

Abdomen yellow ; segment seven and basal two-thirds of eight brownish black ; segments three and four with weak brown lateral spots ; hypopygium yellow ; tergites with conspicuous setigerous punctures on the broad posterior rings. Eighth sternite with a conspicuous group of long erect setæ. Male hypopygium (fig. 5) with the median area of tergite, *9t*, produced into a broad lobe that is densely set with blackened spinous points, these continued backward on ventral face for more than one-third the length of the sclerite ; apex of median lobe very gently emarginate ; lateral tergal lobes feebly developed, with long setæ. Dististyles, *d*, as shown. Lobe of ninth sternite, *9s*, broadly depressed, bilobed by a deep U-shaped median notch, the surface roughened by abundant setigerous tubercles that bear short pale setæ.

Hab. Ecuador (Oriente).

Holotype, ♂, Jatun Yacu, altitude 700 metres, March 1937 (*MacIntyre*) *Allotopotype*, ♀, pinned with type.

Tipula sternohirsuta is readily told from other regional allies by the structure of the male hypopygium, especially of the tergite, dististyle and median lobe of the ninth sternite. It appears to be most nearly allied to *T. prolixisterna*, sp. n., and *T. lenta*, sp. n , differing conspicuously in the hypopygial structure.

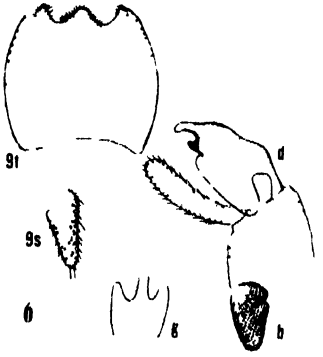
Tipula infida, sp. n. (Fig. 6.)

Allied to *parishi* ; general coloration medium brown, the thoracic pleura paling to yellow ; antennæ of male unusually long, flagellum black, with the more proximal segments narrowly brightened at the incisures ; wings with a strong brown tinge, the stigma and costal border darker ; tip of R_{1+2} atrophied ; abdominal tergites brown, the sternites yellow ; a conspicuous black subterminal ring ; male hypopygium with the tergite conspicuous, its caudal margin trilobed ; median lobe broad-based ; dististyle small and simple in structure.

Male.—Length about 10 mm. ; wing 11 mm. ; antennæ about 7·5 mm.

Frontal prolongation of head brownish yellow ; nasus darker ; palpi dark brown. Antennæ (male) unusually long, as shown by the measurements ; basal three antennal segments yellow, the third a trifle more infuscated ; remainder of flagellum black, the more proximal four or five segments very narrowly brightened at the incisures, especially on the bases of the segments ; outer segments uniformly darkened ; flagellar segments elongate, very feebly incised, much longer than the verticils ; terminal segment reduced. Head medium brown ; anterior vertex wide, without a distinct tubercle

Thoracic dorsum medium brown, the præscutal stripes barely indicated by the slightly more greyish interspaces. Pleura obscure yellow, the pleurotergite weakly infuscated. Halteres blackened. Legs with the coxæ and trochanters pale yellow ; remainder of legs broken. Wings with a strong brownish tinge, the prearcular field, cells *C* and *Sc*, and the stigma darker brown ; wing-tip in outer radial field somewhat strongly infumated ; veins brown. Venation : *Rs* relatively short, subequal to or a little shorter than *m–cu* ; tip of R_{1+2} atrophied ; cell *1st* M_2 about twice as long as wide ; petiole of cell M_1 about one-third longer than *m* ; cell *2nd A* narrow.



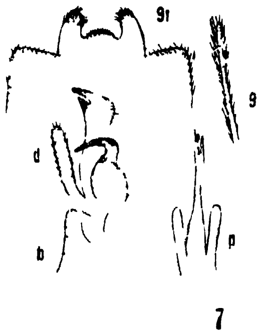


Fig 6 —*Tipula infida*, sp. n Male hypopygium, details
Fig. 7 — *Tipula icasta*, sp n. Male hypopygium, details

Symbols · *b*, basistyle , *d*, dististyle , *g*, gonapophysis , *p*, phallosome , *9s*, lobe of ninth sternite , *t*, 9th tergite

Abdominal tergites brown, the basal ring feebly brightened medially ; sternites yellow ; a conspicuous black subterminal ring ; hypopygium yellow. Male hypopygium (fig. 6) with the tergite, *9t*, a conspicuous plate that is approximately as broad as long, the caudal margin trilobed, the median lobe broader but not longer than the laterals; margin of median lobe and mesal-apical angle of lateral lobes with short black spinous setæ; remainder of disk of tergite except at base with setæ, longer and more conspicuous on lateral margin. Basistyle, *b*, with a conspicuous blackened lobe on mesal face, as in the group. Outer dististyle short and broad. Inner style, *d*, unusually simple in structure, the lobes short; setæ abundant but pale and relatively short and inconspicuous. Notch of ninth sternite, 9*s*, with a pair of relatively short pendant lobes that are clothed with long pale setæ. Eighth sternite only moderately sheathing, the caudal margin paling to yellow, very gently emarginate, with a relatively sparse group of long pale setæ that are more or less decussate at the mid-line.

Hab. Ecuador (Oriente).

Holotype, ♂, Jatun Yacu, 700 metres, March, 1937 (*MacIntyre*).

Tipula infida is still another species of dull colour and insignificant appearance that is most readily told from its nearest allies, such as *T. sternohirsuta*, sp. n., *T. lenta*, sp. n., and *T. prolixisterna*, sp. n., by the structure of the male hypopygium.

Tipula icasta, sp. n. (Fig. 7.)

Allied to *parishi*; general coloration of thoracic notum almost uniform brown, the pleura paling to testaceous yellow; antennæ (male) elongate, flagellum black; legs brown, the femoral bases brightened; wings with a strong brownish tinge, the costal region, with the stigma, darker; R_{1+2} entire; cell *2nd A* long and narrow: abdominal tergites dark brown, the sternites obscure yellow, subterminal segments blackened, hypopygium yellow; male hypopygium with the caudal margin of tergite produced into a low rounded lobe, subtended on either side by a stout lobe that is tufted with coarse black setæ; inner dististyle with a conspicuous blackened hook at base; notch of ninth sternite with two long and slender pale lobes; ædeagus trifid at apex; eighth sternite short, not sheathing.

Male.—Length about 12 mm.; wing 11·5 mm.; antennæ about 6·5 mm.

Frontal prolongation of head medium brown above, obscure yellow on sides and beneath; nasus distinct; palpi with basal two segments dark brown; third segment obscure yellow, the elongate terminal segment yellow with the apex passing into brownish black. Antennæ (male) elongate, as shown by the measurements; scape and pedicel brownish yellow, flagellum black, the base of the first segment vaguely brightened; flagellar segments elongate, only moderately incised, the verticils much shorter than the segments. Head uniformly dark brown.

Mesonotum almost uniformly brown, the usual præscutal stripes barely indicated by paler interspaces. Pleura testaceous yellow. Halteres black. Legs with the coxæ and trochanters yellow; femora brown, obscure yellow at bases; tibiæ and tarsi dark brown to brownish black. Wings relatively narrow, with a strong brownish tinge, the prearcular field, with cells *C* and *Sc*, still darker; stigma oval, dark brown; cells beyond cord, especially in outer radial field, somewhat deeper in colour than the basal cells; obliterative areas at cord very restricted in area; veins dark brown. Venation: *Rs* about one-third longer than *m–cu*; R_{1+2} entire; petiole of cell M_1 a little longer than *m*; cell *2nd A* long and narrow.

Abdominal tergites dark brown, the sternites obscure yellow; subterminal segments more blackened; hypopygium yellow. Male hypopygium (fig. 7) with the tergite, *9t*, subquadrate, the caudal margin slightly produced into a low rounded lobe subtended on either side by a stout lobe that is tufted with coarse black setæ. Basistyle, *b*, elongate, with the usual blackened lobe at base. Dististyles, *d*, as figured. Notch of ninth sternite with two long and slender pale lobes, *9s*, that bear long pale setæ. Ædeagus, *p*, trifid at apex. Eighth sternite short and transverse, not at all sheathing, the margin simple, unarmed.

Hab. Ecuador (Oriente).

Holotype, ♂, Jatun Yacu, altitude 700 metres, February, 1937 (*MacIntyre*).

Tipula icasta is closest to species of the group such as *T. detecta* Alexander, *T. effeta* Alexander, and similar species of inconspicuous coloration and with cell *2nd A* of wing very narrow. I had formerly believed that such species could be maintained as a group separate from those more nearly allied to *T. parishi* Alexander, but with the discovery of many new species this course scarcely seems advisable. As is the case with all such species, excellent characters for defining the forms are to be found in the male hypopygium, but the females will be very difficult to distinguish.

Tipula macintyreana, sp. n. (Fig. 8.)

Belongs to the *monilifera* group; general coloration dark brown, the præscutum variegated with brownish yellow; pleura yellow, variegated with brown; antennæ (male) elongate, the basal flagellar segments bicolored; legs brownish black, the femora with a conspicuous, pale yellow, subterminal ring; tarsal segments paling to brown; wings dark brown, rather sparsely patterned with cream-coloured spots and bands; male hypopygium with the tergite very narrow, transverse, the caudal margin with a U-shaped notch; eighth sternite with the apical lobe short and broad, weakly notched apically.

Male.—Length about 14 mm.; wing 15 mm.

Female.—Length about 17 mm.; wing 17·5. mm.

Frontal prolongation of head dark brown; nasus distinct; palpi dark brown. Antennæ (male) elongate; scape obscure yellow, pedicel clear yellow; proximal flagellar segments bicoloured, the bases black, the stems yellow; on the third or fourth flagellar segments the bicoloured nature becomes obscured, the outer segments presumably being uniform black (antennæ broken beyond the sixth segment); flagellar segments nodulose, as in the group; in addition to the verticils, the segments with unusually long coarse setæ that exceed one-half the length of the verticils. Antennæ of female short, the verticils exceeding the segment in length. Head brown, the front and orbits more or less variegated with obscure yellow.

Pronotum brown, darker laterally. Mesonotal præscutum with the restricted ground-colour obscure brownish yellow, this almost obliterated by four dark brown stripes and darkened humeral and lateral areas; median ground area indicated in front, on cephalic portion of præscutum further split by a short brown median dash; posterior sclerites of notum chiefly dark brown, the median area of scutum and margins of scutal lobes more obscure brownish yellow. Pleura obscure yellow, variegated with brown, most evident as a broad dorsal stripe extending from the cervical region across the propleura, anepisternum and dorsal pteropleurite; narrower and less evident brown areas on border of sternopleurite and anepisternum, and again on the ventral sternopleurite. Halteres brown, the base of stem narrowly yellow. Legs with coxæ brownish yellow; trochanters yellow; femora obscure yellow on basal third to half, thence passing into black, enclosing a very conspicuous, pale yellow subterminal ring its own length from tip; tibiæ and tarsi brownish black, the outer segments of the latter fading to pale brown. Wings with the ground-colour chiefly dark brown, variegated with cream-coloured spots and bands; cell *C* almost uniformly medium brown, darker at both ends; cell *Sc* light yellow, with four alternating dark brown areas, the third above the origin of *Rs*; cells beyond cord almost uniformly darkened, restrictedly brightened beyond stigma; in the type male, this post-stigmal brightening involves only cell R_2, in the female slightly more extensive, including bases of cells R_2, R_3 and R_5; outer end of cell R_5 and base of cell M_1 restrictedly brightened; pale areas before cord more extensive, including a zigzag band

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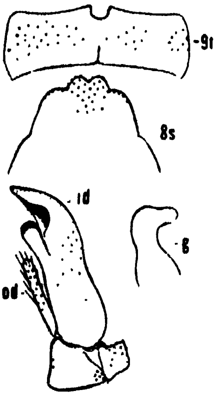


Fig. 8.—*Tipula macintyreana*, sp. n.

Male hypopygium, details. Symbols: *g*, gonapophysis; *id*, inner dististyle; *od*, outer dististyle; *s*, 8th sternite; *t*, 9th tergite.

across outer ends of cells *R*, *M* and *Cu*, and more or less extensive brightening in bases of cells *R*, *M*, *Cu* and the anals; veins brown, brighter in the pale areas. Venation: *Rs* long, nearly twice *m–cu*; petiole of cell M_1 subequal to *m*.

Abdomen brownish black to black, the extreme basal segments paler, brownish yellow to obscure yellow. Male hypopygium (fig. 8) small, the tergite, *9t*, very narrow, transverse, its width nearly three times the length at midline; caudal margin with a U-shaped notch, the margins of which are microscopically roughened. Basistyle with lobe short and obtuse, subrectangular in outline. Dististyles, *id*, *od*, as shown. Eighth sternite, *8s*, moderately large and sheathing, the membranous caudal margin produced into a very small lobe, the apex of which is shallowly emarginate by a V-shaped notch; lobe and adjacent shoulders of sternite with long, coarse setæ. Ædeagus unusually short and stout.

Hab. Ecuador (Tungurahua).

Holotype, ♂, Baños, altitude 2200 metres, May 5, 1939 (*MacIntyre*).

Allotype, ♀, Chaupi, near Baños, altitude 2300 metres, March 18, 1939 (*MacIntyre*).

Tipula macintyreana is named in honour of my good friend, William Clarke-MacIntyre, who has added vastly to our knowledge of the Tipulidæ of Ecuador. The species is entirely different from all other members of the *monilifera* group so far defined. In the unusually heavy wing-pattern, femoral markings, and, especially, the structure of the male hypopygium, the fly is so distinct as to require no comparison with other species.

Epiphragma (*Epiphragma*) *parviseta*, sp. n.

General coloration of mesonotum dark brown, the præscutum with three confluent stripes; antennæ (male) elongate, 16-segmented; flagellar segments long-cylindrical, with a coarse erect pubescence and relatively short verticils; halteres elongate; wings broad, heavily patterned with brown; a series of four or five brown spots in cell *Cu*; outer end of cell *2nd A* with about five circular brown markings; male hypopygium with the tergal lobes small and inconspicuous; outer dististyle narrow, the apex a slender decurved point.

Male.—Length about 12 mm.; wing 12 mm.; antennæ about 5·5 mm.

Rostrum brownish yellow; palpi brownish black. Antennæ (male) very long, nearly one-half the length of body; scape and pedicel pale brown; first flagella segment yellow, succeeding segments uniformly dark brown; flagellum with fourteen distinct segments, the first thus not a fusion; flagellar segments long-cylindrical, with a coarse erect pubescence and relatively short verticils, the longest about one-fourth the length of the segment; pubescence about one-third as long as the verticils. In *filiformis*, the antennæ are shorter, the verticils long and very conspicuous, the longest nearly two-thirds the length of the segment and many times the length of the short dense pubescence. Head chestnut brown; anterior vertex relatively wide, about twice the diameter of scape.

Mesonotal præscutum chiefly covered by three confluent brown stripes, the ground-colour restricted to small, obscure brownish yellow humeral areas; lateral borders of præscutum narrowly dark brown; scutum dark brown, including the median area; scutellum brownish black; mediotergite dark in central portion, the sides broadly grey pruinose. Pleura extensively dark brown, variegated with silvery areas on dorsal sternopleurite, ventral pteropleurite and meral region; dorsopleural membrane dark brown. Halteres elongate; stem and apex of knob yellow, base of knob infuscated. Legs with coxæ brownish yellow; trochanters obscure yellow; remainder of legs broken. Wings broad; ground-colour pale yellow, heavily patterned with solid brown areas that are partly ocelliform; marginal areas beyond stigma solid; a series of four or five isolated brown spots in cell *Cu*; outer end of cell *1st A* with about four dark areas, of cell *2nd A* with about five circular markings; veins pale brown, yellow in the ground costal areas. Venation: *Rs* square at origin; R_{2+3+4} short and elevated; R_3 long, subequal to R_{2+3}; *m–cu* just beyond mid-length of cell *1st* M_2; cell *2nd A* narrower than in *filiformis*.

Abdominal tergites dark brown; sternites pale yellow, the basal rings weakly infuscated; hypopygium yellow. Male hypopygium with the tergal lobes small and inconspicuous. Inter base terminating in a triangular recurved point. Outer dististyle narrow, the apex a slender decurved point. Inner dististyle flattened, with a group of setæ on basal half.

Hab. Ecuador.

Holotype, ♂, Mount Tungurahua, altitude 2600 metres, April 5, 1939 (*MacIntyre*).

Epiphragma (*Epiphragma*) *parviseta* is closest to *E.* (*E.*) *filiformis* Alexander, from lower altitudes in the Ecuadorean Andes. The present fly is readily told by the longer antennæ, with the nature of the pubescence and verticils quite distinct, by the coloration of the mesonotum and wings, and by the details of structure of the male hypopygium.

Gonomyia (*Progonomyia*) *balzapambæ*, sp. n. (Fig. 9.)

General coloration of disk of mesonotum grey, the præscutum with three conspicuous brown stripes, the lateral and humeral regions pale yellow ; antennæ black, the proximal end of the first flagellar segment pale ; thoracic pleura conspicuously striped with black and yellow ; femora yellowish brown, the tips darker brown ; wings subhyaline, the small stigma dark brown ; paler brown washes in proximal portions of outer radial field and in cell *M* ; *Sc* long ; abdomen brownish black ; male hypopygium with the outer dististyle terminating in a long, nearly straight apical spine ; apex of ædeagus subtended by conspicuous pale setiferous shoulders.

Male.—Length about 6 mm. ; wing 7 mm.

Rostrum brownish yellow ; palpi black. Antennæ black, the base of first flagellar segment restrictedly obscure yellow ; flagellar segments long-oval. Head grey.

Pronotum yellow, the median area broadly dark brown. Mesonotal præscutum with the discal interspaces grey, the stripes dark brown ; lateral and humeral portions of præscutum conspicuously pale yellow ; pseudosutural foveæ black ; scutum grey, the lobes darker ; scutellum dark brown ; mediotergite brownish grey, the cephalic lateral portion yellow. Pleura pale yellow, conspicuously striped longitudinally with black, the surface sparsely pruinose ; dorsal black stripe extending from the propleura across the anepisternum, including the dorsal pteropleurite and pleurotergite, the two latter invaded by yellow spots ; ventral black stripe including the ventral sternopleurite and the meral region. Halteres with stem pale yellow, knob infuscated. Legs with the coxæ obscure yellow, the middle and hind pair darker; trochanters brownish yellow; femora yellowish brown, the tips darker brown; tibiæ brown, the tips restrictedly darker; tarsi black. Wings subhyaline, the small stigma dark brown; paler brown washes in proximal portions of outer radial field and in cell *M* adjoining vein *Cu*; veins dark brown. Venation: *Sc* long, Sc_1 ending about opposite mid-length of the long, evenly arcuated *Rs*,

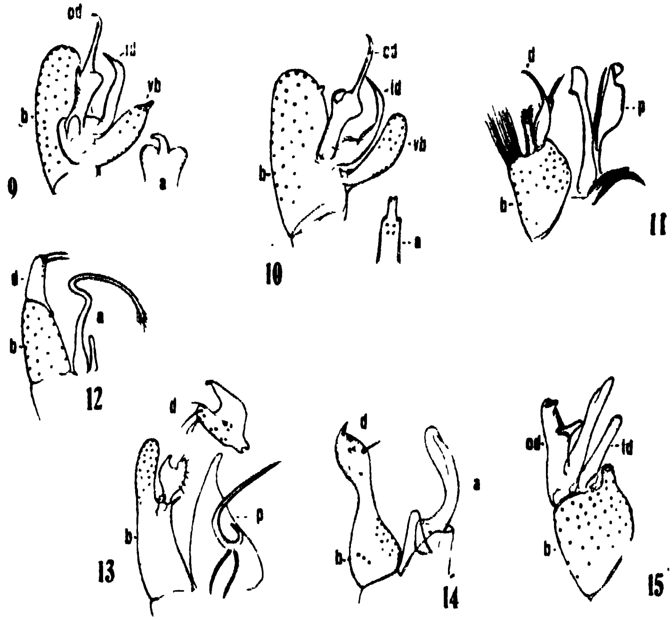


Fig. 9.—*Gonomyia* (*Progonomyia*) *balzapambæ*, sp. n. Male hypopygium.
Fig. 10.—*Gonomyia* (*Progonomyia*) *catamarcensis*, sp. n. Male hypopygium.
Fig. 11.—*Gonomyia* (*Gonomyia*) *crinita*, sp. n. Male hypopygium.
Fig. 12.—*Gonomyia* (*Lipophleps*) *leonura*, sp. n. Male hypopygium.
Fig. 13.—*Gonomyia* (*Lipophleps*) *projecta*, sp. n. Male hypopygium.
Fig. 14.—*Gonomyia* (*Lipophleps*) *cultrata*, sp. n. Male hypopygium.
Fig. 15.—*Erioptera* (*Empeda*) *abitaguai*, sp. n. Male hypopygium.

Symbols: *a*, ædeagus; *b*, basistyle; *d*, dististyle; *id*, inner dististyle; *od*, outer dististyle; *p*, phallosome; *vb*, ventral lobe of basistyle.

Sc_2 at near mid-distance between origin of *Rs* and tip of *Sc_1*; *R_2* faintly indicated but present, just before the fork of *R_{2+3+4}*; cell *2nd M_2* a little longer than its petiole; *m–cu* at fork of *M*.

Abdomen brownish black, the pleural portions a little brightened; hypopygium dark. Male hypopygium (fig. 9) with the outer dististyle, *od*, terminating in a long, nearly straight, apical spine, the apex acute, at near mid-length of style, at base of apical spine, bearing a small spinous point on outer margin. Ventral lobe of basistyle, *vb*, narrowed at apex. Apex of ædeagus, *a*, slightly decurved subtended by conspicuous pale shoulders that are provided with several setæ.

Hab. Ecuador.

Holotype, ♂, Balzapamba, altitude 700 metres. May 20, 1938 (*MacIntyre*).

Gonomyia (*Progonomyia*) *balzapambæ* is quite distinct from all previously defined species, though closely allied to the species next defined as *G.* (*P.*) *catamarcensis*, sp. n. The chief distinctions between the two species lie in the pattern and venation of the wings, and in the structure of the male hypopygium.

Gonomyia (*Progonomyia*) *catamarcensis*, sp. n. (Fig 10.)

Male.—Length about 5–6 mm.; wing 5·5–7 mm.

Closely related to *G.* (*P.*) *balzapambæ*, sp. n., differing especially in the pattern and venation of the wings, and in the structure of the male hypopygium. Wings with a weak brown tinge, the stigma slightly darker than the ground, larger but much paler than in *balzapambæ*; no distinct infuscation elsewhere on wing except vague clouds along cord. Venation: *Rs* elongate, nearly straight; cell *2nd A* wider than in *balzapambæ*. Male hypopygium (fig. 10) with a small obtuse lobe on mesal face of basistyle, *b*, beyond the point of insertion of the dististyles. Outer dististyle, *od*, with the lateral spine at near mid-length long and conspicuous, the style conspicuously dilated at this point. Ventral lobe of basistyle, *vb*, obtusely rounded at apex. Ædeagus, *a*, with apex slender, the subtending shoulders greatly reduced, with fewer setæ.

Hab. Argentina (Catamarca).

Holotype, ♂, Santa Maria, December 19, 1920 (*V. Weiser*). *Paratopotype*, ♂, December, 22, 1920.

Gonomyia (*Gonomyia*) *crinita*, sp. n. (Fig. 11.)

General coloration of mesonotum brownish grey, the scutellum broadly yellow; rostrum obscure yellow; antennæ black; legs black; wings greyish, the stigma weakly darkened; *Rs* about two-thirds as long as the straight R_{2+3+4}; *m–cu* beyond fork of *M*; male hypopygium with the outer lobe of basistyle very short and stout, tufted with long yellow setæ; phallosome including four distinct elements, the second longest a black rod with apex expanded into a weak spatula, the shortest element bifid.

Male.—Length about 4·5–5 mm.; wing 5–5·5 mm.

Female. -Length about 6 mm.; wing 6 mm.

Rostrum obscure yellow above; palpi black. Antennæ black throughout; basal flagellar segments oval, becoming more elongate outwardly. Head dark grey, the central occipital region a little more orange.

Pronotum brown; anterior lateral pretergites orange. Mesonotal præscutum and scutum almost uniform dark brownish grey; scutellum broadly yellow, restrictedly darkened medially; postnotum grey. Pleura with the propleura and mesepisternum weakly darkened, the remainder of pleura and the pleurotergite pale. Halteres with stem pale, weakly darkened on outer face; trochanters dusky; remainder of legs black. Wings greyish, the stigmal region weakly infumed, its limits vague; prearcular and costal fields more yellowish; veins dark brown; Venation: Sc_1 ending just before origin of *Rs*, Sc_2 near its tip; *Rs* about two-thirds the length of the straight R_{2+3+4}; *m–cu* from one-third to one-half its length beyond the form of *M*. In the paratype, cell M_2 of one wing is open by the atrophy of *m*.

Abdomen dark brown to brownish black, the sternites with grey posterior borders. Male hypopygium (fig. 11) with the outer lateral lobe of basistyle, *b*, very short and stout, tufted with long yellow setæ. Outer dististyle a small slender black rod, with numerous coarse setæ. Inner dististyle, *d*, longer, appearing as a slender black spine from a dilated base, at near mid-length bearing a pale lobe tufted with setæ, including the usual two fasciculate ones. Phallosome, *p*, complex, including four distinct elements, the longest a flattened pale blade, the apex narrowed, this blade subtended by a slender straight spine, the blackened tip acute; third element a straight black rod, the apex expanded into a weak spatula provided with microscopic setulæ; fourth structure shortest, appearing as a blackened, slightly curved rod that bears a slender simple lateral branch.

Hab. Ecuador (Oriente).

Holotype, ♂. Abitagua, altitude 1100 metres, September 1, 1939 (*MacIntyre*). *Allotopotype*, ♀. *Paratopotype*, ♂.

In the structure of the male hypopygium, *Gonomyia* (*Gonomyia*) *crinita* is entirely distinct from generally similar species in this subgenus. The nature of the outer lobe of the basistyle and the phallosome are entirely different from other described species.

Gonomyia (*Lipophleps*) *leonura*, sp. n. (Fig. 12)

Belongs to the *manca* group; thoracic pleura unpatterned; Sc_1 ending some distance before origin of *Rs*; male hypopygium with the dististyle entirely fleshy, relatively elongate; ædeagus long and sinuous, at apex bearing numerous long pale setæ.

Male.—Length about 3·5 mm.; wing 3·4 mm.

Rostrum obscure yellow; palpi black. Antennæ black throughout. Head chiefly infuscated, more orange on central portions.

Mesonotum medium brown, the lateral pretergites narrowly pale yellow; median area of scutum and posterior border of scutellum more yellowish. Pleura yellow, unmarked. Halteres weakly infuscated. Legs with the coxæ and trochanters yellowish testaceous; remainder of legs brown. Wings with a weak brown tinge, the prearcular and costal fields slightly more whitish; stigma lacking; veins pale brown. Venation: Sc_1 ending some distance before origin of *Rs*, the distance being about two-thirds the length of the latter vein; *m–cu* just before fork of *M*.

Abdomen brown; hypopygium more yellowish. Male hypopygium (fig. 12) with the dististyle, *d*, single, entirely fleshy, more elongate than usual, being about three times as long as thick, tipped with two fasciculate bristles. Phallosome asymmetrical, moderately complex, consisting of a slender apophysis and a more intricate longer structure (this latter not figured); ædeagus, *a*, very long and slender, sinuous, at apex bearing numerous long pale setæ.

Hab. Ecuador.

Holotype, ♂, Balzapamba, altitude 700 metres, May 27, 1938 (*MacIntyre*).

Gonomyia (*Lipophleps*) *leonura* is readily distinguished from *G.* (*L.*) *inermis* Alexander and the now numerous allied forms that have the dististyle of the male hypopygium fleshy. The elongate sinuous ædeagus that is tufted at apex with long pale setæ is distinctive of the species.

Gonomyia (*Lipophleps*) *projecta*, sp. n. (Fig. 13.)

Belongs to the *manca* group; antennæ black throughout; scutellum broadly yellow; thoracic pleura very heavily striped with dark brown and yellowish white; legs black; wings greyish, stigma very poorly defined; male hypopygium with the outer angle of basistyle produced beyond apex of dististyle; mesal-apical angle of basistyle produced into a small spine; phallosome broadly flattened, the ædeagus slender.

Male.—Length about 4 mm.; wing 4·5 mm.

Female.—Length about 5·5 mm.; wing 5 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments long-oval to fusiform. Head dark grey.

Lateral pretergites light yellow. Mesonotal præscutum uniformly dark brown, sparsely pruinose; scutum similarly darkened, the anterior portion of median region obscure yellow; scutellum broadly yellow, darkened at base; mediotergite dark brown, pruinose. Pleura dark brown, pruinose, very conspicuously striped longitudinally with yellowish white, the line extending from behind the fore coxæ to beneath the root of the haltere; a pale spot on dorsal pteropleurite beneath wing-root. Halteres pale brownish yellow. Legs with the coxæ dark brown, the fore pair paler; trochanters dark brown; remainder of legs black. Wings greyish, the prearcular and costal fields a little more yellowish; stigmal region very faintly and diffusely darkened; veins brown, paler in the flavous costal areas. Venation: Sc_1 ending opposite or just before origin of *Rs*; vein R_5 deflected strongly caudad, terminating just before wing apex; *m–cu* shortly before fork of *M*.

Abdominal tergites dark brown, the sternites a trifle paler; hypopygium dark brown. Male hypopygium (fig. 13) with the basistyle, *b*, slender, the outer angle produced caudad as a stout pale lobe that much exceeds the dististyle in length; mesal face at base of dististyle with a small slender spine. Dististyle, *d*, a flattened disk, the outer angle produced into a stout setiferous lobe; a pair of setæ closely approximated at their bases, apparently from a single puncture; fasciculate setæ separate, the outer one smaller. Phallosome, *p*, appearing as a broadly flattened central blade that narrows outwardly to a subacute point; on face bearing a long slender rod that appears to represent the ædeagus.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 100 metres, September 1, 1939 (*MacIntyre*). *Allotopotype*, ♀. *Paratopotypes*, 2 ♂♂.

Gonomyia (*Lipophleps*) *projecta* is entirely different from the other described species of *Lipophleps*. As usual in the genus, the structure of the male hypopygium furnishes the chief characters for the recognition of the fly.

Gonomyia (*Lipophleps*) *cultrata*, sp. n. (Fig. 14.)

Belongs to the *manca* group; general coloration deep brown; scutellum yellow; thoracic pleura with a weakly contrasting pattern of pale brown, striped with white; legs dark brown; wings brownish, the stigma very poorly differentiated; male hypopygium with the body of the basistyle unusually small, narrowed outwardly and merging with the simple dististyle, the latter clothed with abundant setulæ and terminating in a pale spine.

Male.—Length about 3·8 mm.; wing 4 mm.

Rostrum yellow; palpi black. Antennæ black; verticils elongate. Head yellow, the occiput restrictedly darkened.

Lateral pretergites china-white. Mesonotum deep brown, the mesal edges of scutal lobes restrictedly brightened; scutellum, including parascutella, yellow; mediotergite pale on cephalic half, the posterior portion darker. Pleura pale brown, striped with whitish, the pattern poorly contrasting. Halteres brownish black, the base of stem yellow. Legs with the coxæ testaceous; trochanters brownish yellow; remainder of legs dark brown. Wings with a rather strong brown tinge, the prearcular and costal regions light yellow; stigma very poorly differentiated; veins pale, brighter in the costal portion. Venation: Sc_1 ending a short distance before origin of *Rs*, the latter exceeding one-half the length of its anterior branch; *m–cu* at fork of *M*.

Abdomen dark brown, the sternites slightly brightened; hypopygium yellowish brown. Male hypopygium (fig. 14) with the body of basistyle, *b*, unusually small, narrowed apically and merging without suture into the simple dististyle, *d*; region of dististyle terminating in an acute spine; fasciculate on inner margin of style some distance back from tip; entire region of dististyle with delicate microscopic setulæ. Phallosome simple, consisting chiefly of a strong curved rod that is interpreted as being the ædeagus, *a*.

Hab. Ecuador (Tungurahua).

Holotype, ♂, Baños, altitude 1800 metres, May 9, 1937 (*MacIntyre*).

Gonomyia (*Lipophleps*) *cultrata* is quite distinct from all species of the genus so far described. Although somewhat similar to *G.* (*L.*) *inermis* Alexander and allied forms, the present fly is really entirely different in the unusually small basistyle which merges directly with the simple dististyle, without suture.

Erioptera (*Empeda*) *abitaguai*, sp. n. (Fig. 15.)

Size small (wing, male, about 3 mm.); general coloration brownish grey, scutellum obscure yellow; antennæ and legs black, the latter with a vestiture of flattened elongate scales in addition to the normal setæ; wings with a greyish tinge, the prearcular and costal fields slightly more yellowish; Sc_1 ending just before mid-length of *Rs*; fork of cell R_3 relatively deep; male hypopygium with the outer dististyle entirely blackened, deeply bifid, the outer arm moderately long, the apex with three or four lobes; inner arm a little longer, simple.

Male.—Length about 2·6 mm.; wing 3 mm.

Rostrum yellow ; palpi black. Antennæ black throughout ; flagellar segments oval ; verticils elongate. Head dark grey.

Mesonotum brownish grey, the pretergites and very restricted humeral region of the præscutum yellow ; scutellum obscure yellow. Pleura testaceous yellow. Halteres with stem yellow, knob brown. Legs with the coxæ and trochanters testaceous yellow, remainder of legs black ; vestiture of legs including elongate flattened scales, in addition to the sparse setæ. Wings with a greyish tinge, the prearcular and costal fields slightly more yellow ; stigmal area barely indicated ; veins brown. Venation : Sc_1 ending just before mid-length of *Rs* ; fork of cell R_3 relatively deep, the veins long ; R_3 longer than R_{3+4} ; *m–cu* close to fork of *M*.

Abdominal tergites dark brown, sternites more yellow ; hypopygium brownish yellow. Male hypopygium (fig. 15) with the outer dististyle, *od*, entirely blackened, deeply bifid, the outer arm of moderate length, with three or four lobes of various sizes at and near apex to produce an irregular head, the longest lobe subapical : inner arm a little longer, parallel-sided ; inner dististyle, *id*. uniformly pale, a narrow, parallel-sided blade, its apex obtuse.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, altitude 1100 metres, September 1, 1939 (*MacIntyre*). *Paratopotypes*, 2 ♂♂.

Erioptera (*Empeda*) *abitaguai* has a hypopygium that is most like that of *E*. (*E*.) *deludens* Alexander, of Mexico, among the described species, yet with the details of structure quite distinct.

XII.—*On* Ptilophyllum gracile, *sp. n.*

By Tom M. Harris, University of Reading.

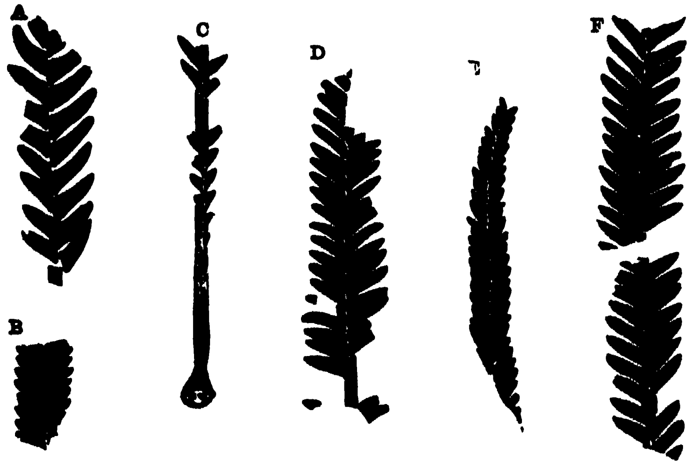
There is an abundant series of leaves known by the name *Ptilophyllum pecten* in the Yorkshire Estuarine series ; this is an aggregate species, and one of its units is described here. It is hoped eventually to clear up this and other groups of the Yorkshire Jurassic flora, with a view to recognizing species with more precise zonal value, and also as a step to the relation of particular reproductive organs to their appropriate leaves. The specimens are included in the Wonnacott Collection from the Middle Estuarine (Bajocian) plant bed of Cayton and Gristhorpe Bay.

Ptilophyllum gracile, sp. n.

Type-specimen.—V. 26755, fig. 1, F ; fig. 3, A, E.

Diagnosis.—Leaf typically about 1 cm. wide. Pinnæ crowded, usually slightly decurrent, apex obtusely pointed.

Fig. 1.



Typical leaf-fragments of *P. gracile* ; all natural size.

A, broadest leaf, V.26756. B, leaf with overlapping pinnæ V.26751, C, leaf base (see also fig. 2 H, V.26758 *a*). D, middle region of leaf. V.26757. E, upper part of leaf with overlapping pinnæ, V.26750 A ; F, type-specimen, V.26755.

Lamina flat, its substance very thick, veins concealed, but upper surface showing many obscure longitudinal grooves.

Cuticle thick, upper cuticle showing uniform cells with very sinuous walls, lower showing a marginal region with cells like those of the upper side, and an inner region of stomates and papillate cells. Stomates somewhat sparse, occurring in broad bands separated by bands with none. Guard cells and subsidiary cells both sunken; epidermal cells small and square with obscurely marked outlines, but bearing a hollow, thickly cutinized papilla.

Description.—*P. gracile* is represented by about thirty specimens, all of which are broken, but otherwise well preserved. They were identified with one another by their close agreement in form and in cuticle. The widest specimen is only 12 mm. wide and most are smaller, as shown in the measurements given below of the leaf width of each fragment (apices and bases of leaves are omitted).

Width mm.	No. of specimens.	Width. mm.	No. of specimens.
4	1	9	3
5	1	10	3
6	2	11	4
7	2	12	2
8	8		

The narrowest of these certainly represent basal or apical regions of leaves. The length of the leaf is unknown, but the proportion of the various parts of the leaf represented among the fragments leads me to suppose it is between 10 and 20 cm.

The pinnæ vary little in shape except at the extreme base and apex of the leaf. In most specimens the pinnæ over the whole middle region of the leaf show a slightly expanded upper margin and a slightly decurrent lower margin, though to see this the pinna below must be chipped away. In some specimens, however, the lower margin is straight, and in a few it is very slightly contracted. The figured specimens illustrate the whole range of pinna size and shape in the collection.

Neither surface of the lamina shows the veins, but the upper shows many fine longitudinal furrows which suggest veins. Their precise behaviour is, however, unlike veins, as they sometimes begin blindly, and it is thought that while some may represent veins others represent fibre bands or secretory ducts not associated with veins: this is evidently the case in another *Ptilophyllum* species in the Gristhorpe bed in which the upper surface shows many similar furrows, while the lower shows the true veins. In *P. gracile* the veins are indicated by the stomates, which, as usual in *Ptilophyllum* leaves, are confined to the areas between them.

The substance of the fossil lamina is remarkably thick, far thicker than that of most leaves in the Gristhorpe bed.

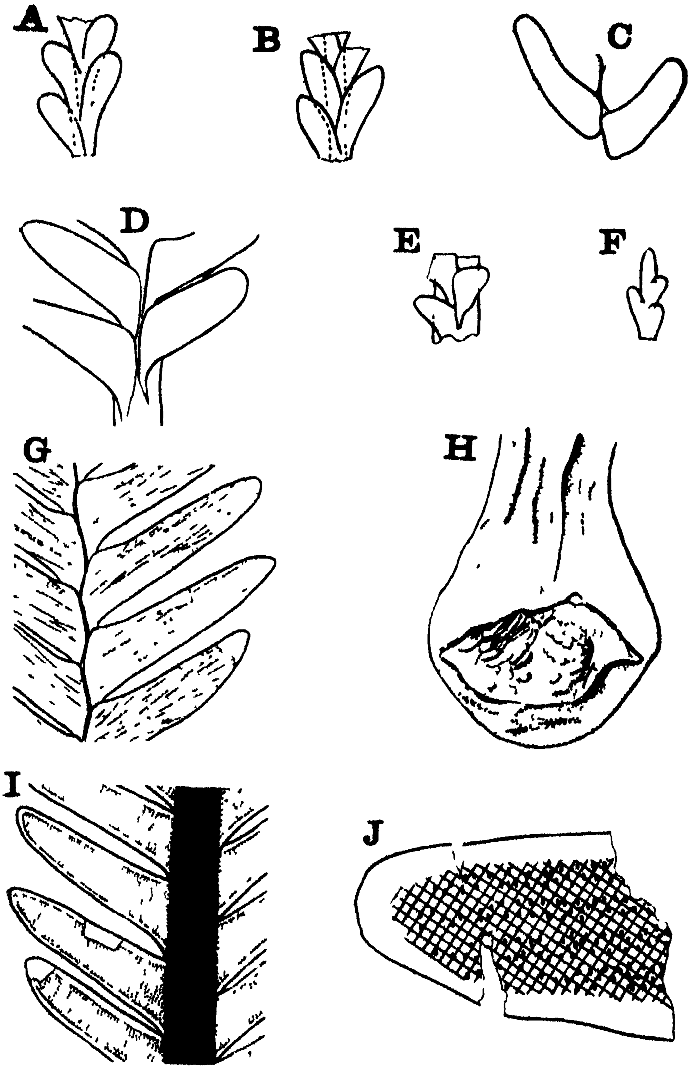
The rachis is entirely concealed by the pinnæ which are attached to its upper surface. It is only 1–1·5 mm. wide, and is smooth, apart from longitudinal cell-furrows. The leaf base is somewhat expanded, and shows a rhomboidal attachment scar just above the lower extremity. The surface of the attachment scar shows two groups of lumps, which suggest the prints of two lateral vascular bundles.

Cuticle.—The cuticle of every specimen was examined, and apart from differences of preservation was found to be uniform. The cuticle of both sides is thick; in one which was microtomed the upper surface measured 5–6 μ, the lower 4 μ over the papillæ. In spite of this, the cuticle was often surprisingly fragile, and sometimes a leaf would yield a good lower cuticle while the upper fell to bits. Owing to the darker colour of the papillæ, and the readiness with which they take up dye, the lower side appears to be the thicker in most preparations.

The upper side shows uniform cells, which give no indication of veins. The lateral walls are not very prominent and are extremely sinuous, so that the lumen is almost obliterated. Trichomes are absent; the whole surface is finely pitted.

The lower side shows two well-marked regions; a marginal zone without stomates, and an inner zone with them. The cells of the marginal zone have walls which are a little less strongly sinuous than those of the upper side. The cells of the inner zone are almost square; the outline is seldom visible, but the whole surface bulges to form a heavily cutinized papilla 30 μ broad, 30 μ high. These papillæ tend to be placed in longitudinal rows.

Among these cells are stomates which occupy broad longitudinal bands separated by narrower bands with none: this arrangement is, however, obscured by the equally heavy cutinization of the epidermal papillæ



Details of *P. gracile* leaf.

A–F, portions of leaves showing the shape of the pinnæ, where overlapped parts were seen they are indicated by broken lines, all × 4. A, B, F are V.26759. C is V.26750 A. D is V.26750 B. E is V.26762. G, I, corresponding portions of a leaf as originally exposed and as seen in transfer, V.26752. In G the surface furrows are shown, in I the stippled region represents the papillate zone. H, leaf base of specimen shown in fig. 1 C after cleaning in HF, × 8, V.26758 *a*. J, portion of pinna cuticle to show the distribution of papillæ (indicated by cross-hatching), and of stomates (indicated by black ovals placed parallel with the aperture), × 20, V.26753.

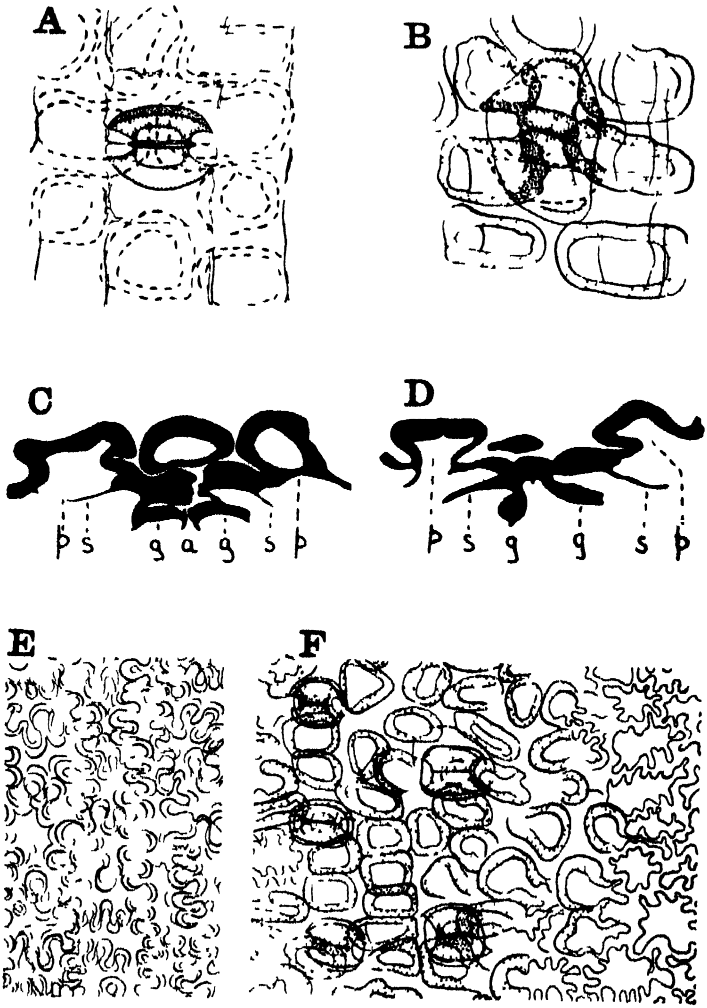
of both regions, and in a few specimens the stomates are uniformly distributed in the papillate zone.

The guard cells are well cutinzed, but are deeply immersed, and can only be clearly seen from the inside (fig. 3, A). Microtome sections were cut through a cuticle, which showed an appearance resembling Florin's (1933 *a*, p. 21) figure of a section through *Otozamites bornholmiensis*; the essential structure is typically Bennettitalean, though it is unusual for both guard and subsidiary cells to be so deeply sunken. It should be mentioned that although every stomate shows its guard-cell thickenings clearly, many scarcely show the inner parts of the subsidiary cells, either because their cuticle is thin and lost, or because it stops short of the better-developed guard-cell cuticle. The subsidiary cell cuticle forms strong outgrowths just over the guard-cell aperture. These outgrowths are as broad as the aperture and solid, unlike those of *P. pecten* as interpreted by Florin (1933 *b*). They are only seen clearly from the outside in occasional stomates not obscured by epidermal papillæ. The papillæ of the surrounding cells are often mushroom shaped, having a head broader than their stalk, and they usually overlap the stomate to a considerable extent. There is no constancy in the exact manner in which the overlap occurs.

Discussion.—*Ptilophyllum gracile* is one of several Bennettitalean leaves now known to show xeromorphy, its xeromorphic features being the very thick substance of its lamina, the sunken position of the stomates and their protection by a layer of cutinized papillæ. Its cuticle is very thick, but the lamina is perfectly flat, unlike some other xeromorphic Bennettitales where it is incurved.

The leaf-base, too, is interesting; the position of the attachment scar, just above and not at the lower extremity suggests a rather swollen organ, which bulged around and below the relatively small attachment scar. Another Bennettitalean leaf, *Nilssoniopteris vittata*, as well as some as yet unnamed Bennettitalean bracts (*Cycadolepis* spp.) in this collection, show very similar attachment scars, and agree also in showing the prints of two vascular bundles, which may thus be of very frequent occurrence in the Bennettitales (see also Thomas's figures, 1915, text-fig. 4).

Fig. 3.



Cuticle of *P. gracile* leaf.

A, stomate, drawn from inside of leaf; the papillæ are indicated by broken lines, V.26755 *a* (type-specimen), × 400. B, another stomate, drawn from outside of leaf to show the papillæ which conceal the guard cells, V.26760, × 400. C, D, adjacent microtome sections cut transversely through a stomate, C almost median. D, just beyond the aperture. *p*, papilla cell; *s*, inward extension of subsidiary cell cuticle; *g*, inward extension of guard-cell cuticle; *a*, aperture, V.26761, × 400. E, upper cuticle of lamina, V.26755 *a* (type-specimen), × 200. F, lower cuticle of lamina, the non-papillate margin is to the right, V.26754 *a*, × 200.

Among specimens of *Ptilophyllum* studied by previous authors there are two, both from Yorkshire, which agree with *P. gracile* in the papillæ of the lower epidermis. In the first, figured by Thomas and Bancroft, 1913, pl. xx. fig. 4, the papillæ were regarded as mere bases of hairs; but in the second, figured by Seward and Sahni, 1920, they were shown to be complete in themselves, and thus papillæ rather than hairs. The dense cover of papillæ must almost certainly have caused a conspicuous paler streak along the surface of the lamina as it does in the leaf of *Taxus* and many other Conifers.

The difficult question of the generic separation of *Ptilophyllum* from *Zamites* is left until more species have been studied. On Halle's (1913) criterion of *Ptilophyllum* being distinguished by a decurrent lower pinna margin, nearly all the present specimens would fall in that genus.

Comparison. The Yorkshire material called *Ptilophyllum pecten* certainly includes many species which need to be described before the distinguishing characters of *P. gracile* can be given fully. It is, however, clear that it differs from most of those figured from Yorkshire and elsewhere in its very small size, but this alone is not a safe character, as there are other Yorkshire species with small leaves, though different structure. Two other types of cuticle structure are known in *Ptilophyllum*; one described under the name *P. pecten* by Thomas and Bancroft (1913), Seward and Sahni (1920), Florin (1933 *b*). A leaf (V. 26756 B) with a cuticle of this type occurs in the present collection. The other type was described as *P. cutchense* by Seward and Sahni (1920). Both differ in the greater exposure of the subsidiary cells, and in possessing very occasional papillæ among the stomates, instead of there being one on nearly every cell.

The identity of the Yorkshire specimens with similar cuticles must be left in doubt till they are more fully described. Those figured by Seward and Sahni (1920) as *P. sp.* may indeed be identical, but that figured by Thomas and Bancroft as *P. sp.* apparently comes from an altogether larger leaf, though this is not entirely clear (see Thomas, 1913). A footnote by Thomas and Bancroft (1913, p. 183) states that "This species will later be described as *Ptilophyllum hirsutum*," but they obviously did not intend this attachment of a name to the figure to be a valid description. The name *P. hirsutum* is thus a *nomen nudum*.

SUMMARY.

1. *Ptilophyllum gracile*, one of the constituent species of the aggregate known under the name *P. pecten*, is described.

2. *P. gracile* is distinguished both by its macroscopic form and by its cuticle structure. It has strongly marked xeromorphic characters.

WORKS QUOTED.

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——. 1933 *b*. "Die Spaltöffnungsapparate der *Williamsonia*, *Williamsoniella*- und *Wielandiella*-bluten (Bennettitales)." Arkiv. for Bot., K. Svenska Vetenskapsakad. Bd. 25 *a*, no. 15.

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XIII.—*On Two Mammalian Teeth from the Lower Rhaetic of Somerset.* By F. R. Parrington, Department of Zoology, Cambridge University.

[Plate II.]

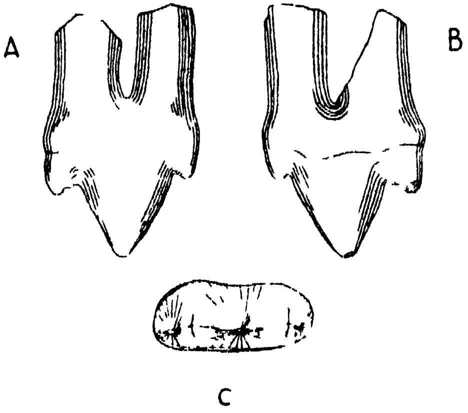
The two specimens described in this note were collected by W. Kühne from the Lower Rhaetic beds at Holwell, near Frome in Somerset, during the summer of 1939. They were extracted from washings which yielded *Microcleptes* (*Microlestes*) teeth obtained from a position designated H. 2 by the collector (Pl. II.).

The interest and importance of the specimens is such that, while their study deserves a thoroughness which is not possible under present circumstances, a brief preliminary account seems worth publishing. They are referred to by the collectors numbers.

Eozostrodon parvus, gen. et sp. n. (Pl. II. ; text-fig. 1.)

The first sepcimen, Holwell IX., text-fig. 1, consists of a very small tricuspid tooth which has two well-formed roots, both of which have been broken off at a point which must have been about halfway down their length. As preserved, the tooth measures 1·75 mm. from the tip of the centre cusp to the broken end of the longer root, and 1·0 mm. anteroposteriorly at the longest part of the base of the crown.

Text-fig. 1.



Eozostrodon parvus, gen. et sp. n. × 30.

A. Outer view ; B. Inner view ; C. Crown view.

The crown is asymmetrical, being flattened on one side and swollen on the other The centre cusp is much larger than the other two, and all three cusps have a slight curve in what must be presumed to be a posterior direction. The posterior of the two accessory cusps is much the larger and is slightly chipped on the anterior edge. Small areas of what are believed to be wear are present on the flattened side of the tips of the centre and posterior cusps.

One of the most interesting features is the presence of an incipient cingulum in the form of a slight, but distinct, ridge which runs along most of the flattened side of the base of the cusps, and also at the base of the larger accessory cusp on the rounded side.

The curving of the cusps is held to be in a posterior direction because similar curving is found in both advanced Theiodonts and in later mammals, and it is always towards the back. It follows that the tooth must be either a right upper or a left lower postcanine. The flattened side of the crown (with the worn areas on two cusps) almost certainly formed the face against which the opposing tooth acted as a shear. If the tooth was a left lower postcanine this face would have been lingual, and the opposing tooth must have worked against the rounded side. Hence, it seems reasonably likely that the tooth is a right upper postcanine. There are no cingula, either internal or external, on the premolars of *Amphilestes*, which is held by Simpson to be the most primitive known Triconodont, but all triconodonts have an internal cingulum on the molars. It would appear likely, therefore, that the tooth is a molar, but the presence of a considerably larger and more highly-organised tooth of the same nature in the same deposits is rather against this interpretation.

Eozostrodon problematicus, sp. n.
(Pl. II.; text-figs. 2 & 3.)

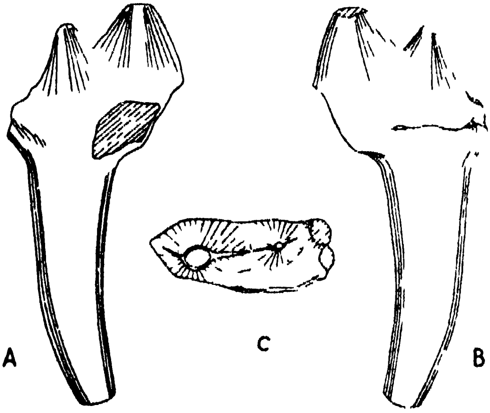
The second specimen, Holwell XIII., text-fig. 2, is larger and less well preserved. It consists of part of the crown, with two cusps and several accessory cuspules, and one complete root. The form of the root, and its position on the crown, indicate quite clearly that a second was originally present.

As preserved, the crown measures about 1·5 mm. antero-posteriorly, while the length from the broken tip of the larger cusp to the end of the root is about 2·7 mm.

The shape of the crown suggests that the larger cusp was the centre one of three. The tip has been broken, but it is sufficiently well preserved to show the same curving that occurs in the cusps of the smaller tooth, and which is believed to indicate the back of the tooth. The second cusp is much nearer in size to the centre cusp than are the accessory cusps of *E. parvus*. The two cusps are less stoutly convex on their "outer" side than are those of the smaller tooth, and they are slightly concave on their "inner" side.

There is a large cingulum developed to the rear of the tooth, where it is broken and difficult to interpret, and round the base of the cusps on the "inner" side. There are two damaged areas on this cingulum, one immediately behind the smaller cusp, which gives some slight indication that a small accessory cusp may have been broken off. On the "inner" side the cingulum carries a fine ridge with two accessory cuspules.

Text-fig. 2.



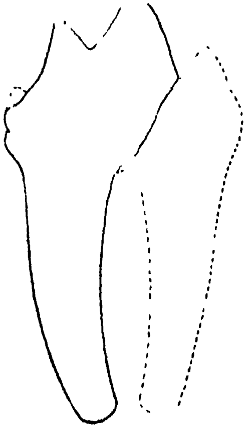
Eozostrodon problematicus, sp. n. × 30.
A. "Outer" view; B. "Inner" view, C Crown view.

While the attempted restoration (text fig. 3) shows a tooth which in "outer" view is like the molar of a Triconodont, the cingulum is peculiar and reminiscent of the general form of *Microcleptes*.

The backward curving of the cusps indicates that the tooth was either a left upper or a right lower postcanine, while the concave "inner" side, on which is developed the cingulum, suggests the shearing-surface, indicating a left upper postcanine. This conclusion is put forward very tentatively, however, since the Triconodont lower molar has an inner cingulum, and it has not been possible for the writer to make comparisons with original material.

The importance of these teeth lies in the fact that they are by far the oldest known mammalian teeth with the exception of the first of the highly aberrant Multituberculates, the earliest known non-Multituberculates occurring in the Middle Jurassic. *Eozostrodon parvus*, indeed, fits very well the hypothetical ancestral mammalian tooth postulated by the Cope Osborn Tritubercular theory. *E. problematicus*, however, is peculiar in its cingulum which, curving round in a U-shape and carrying accessory cuspules, is reminiscent of the *Microcleptes* type of tooth.

Text-fig. 3.



Eozostrodon problematicus, sp. n. × 30.
Attempted restoration.

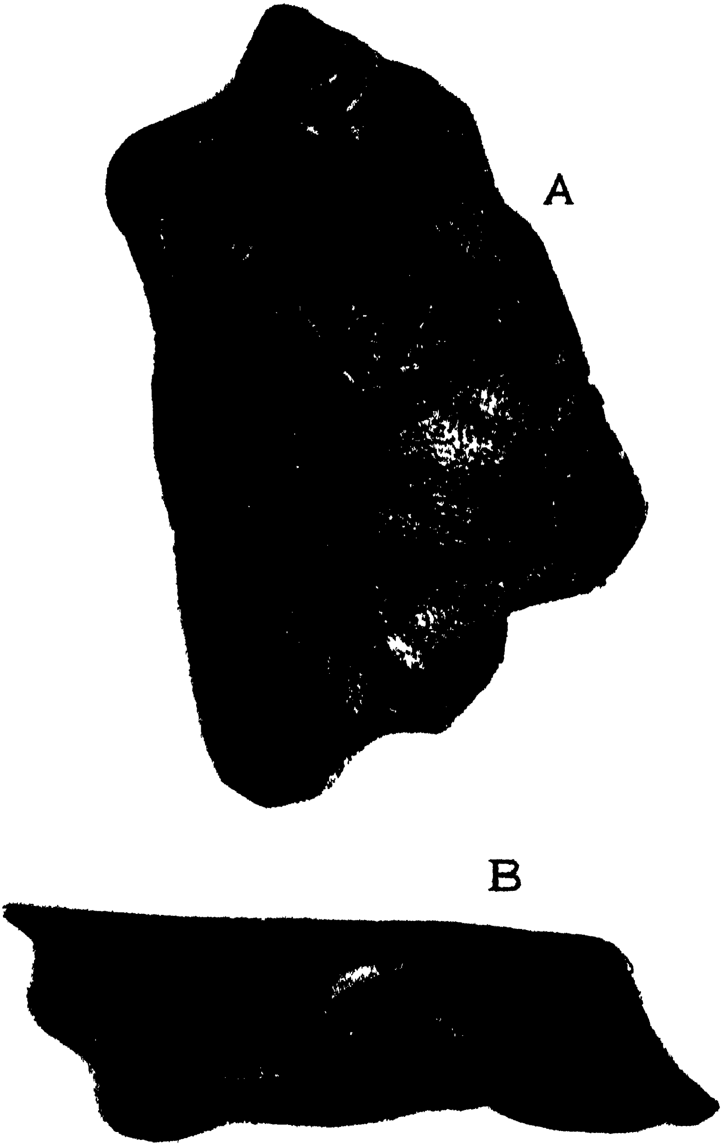
The possibility that these teeth are premolars of this form seems unlikely, owing to the great discrepancy in size and also the discovery by Kühne of small, and at the same time less highly developed *Microleptes* teeth which fit this position.

EXPLANATION OF PLATE II.

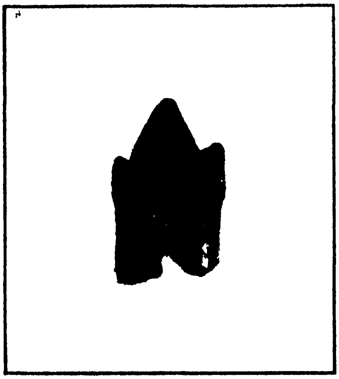
Eozostrodon parvus, gen. et sp. n. × 15.
A. Outer view; B. Inner view; C. Crown view.

Eozostrodon problematicus, sp. n. × 15.
D. Crown view; E. "Outer" view; F. "Inner" view.

WOODWARD. *Ann. & Mag. Nat. Hist. S. 11. Vol. VIII. Pl. I.*



Notopetalichthys hillsi, gen. et sp. n.



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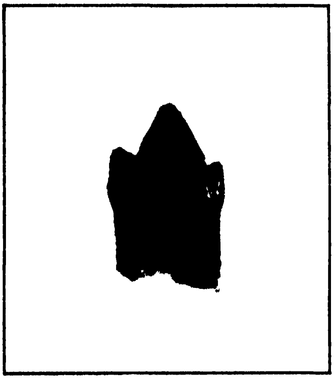

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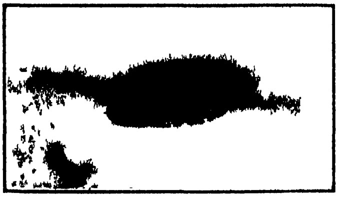

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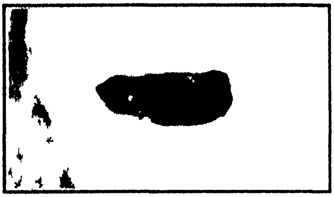

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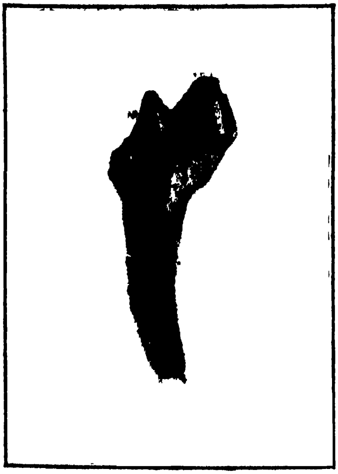

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THE
ANNALS AND MAGAZINE
OF
NATURAL HISTORY

[ELEVENTH SERIES.]

No. 45. SEPTEMBER 1941.

XIV.—*New Species of the Siphonophoran Genus* Lensia *Totton,* 1932. By A. K. TOTTON, Department of Zoology, British Museum (Natural History).

LARGE numbers of specimens of small and unfamiliar Siphonophora Calycophoræ, probably all diphyids, have been picked out of catches made by 'Discovery II' in the Atlantic in the last ten years, and out of catches made by the ill-fated 'Carnegie' on her last cruise. This paper deals briefly with new species that can for convenience be grouped with *Diphyes subtiloides* Lens and van Riemsdijk, 1908, the genotype of *Lensia* Totton, 1932. It is not pretended that the seventeen species are all congeneric.

Six species of *Lensia* are already well known, *conoidea* Keferstein and Ehlers, 1860, *subtilis* Chun, 1886, *subtiloides* Lens and van Riemsdijk, 1908, *fowleri* Bigelow, 1911, *campanella* Moser, 1925, and *multicristata* Moser, 1925. I do not propose to mention them here. A seventh species, to which I give below a new name, was described and figured by Leloup in 1934 under the name *Lensia multicristata* Moser, forme *grimaldii* Leloup. Ten species of *Lensia* new to science are published here *, an eleventh having been recorded and named by Leloup in 1933 as *grimaldii* since the study of this group was started. Four of the new species are what may be called multicristate forms. It has not been possible as yet to associate correctly the anterior and posterior nectophores of all the species, nor are the posterior nectophores dealt with in this paper.

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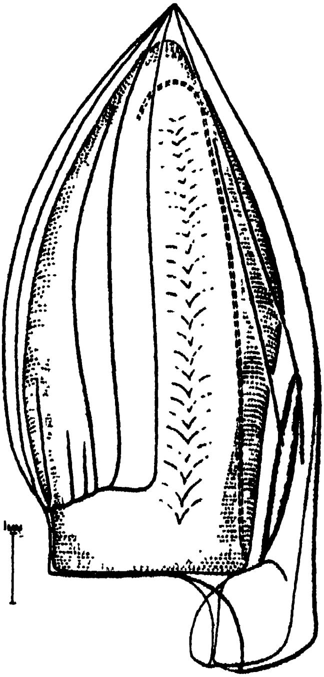
* I have commemorated some of the names of H.M. Ships which took part in the famous exploits at Montevideo, at Jössing Fjord, and in the first attack on Narvik by the Second Destroyer Flotilla on April 10, 1940.

Fig. 1.



Lensia exeter, sp. n. ' Discovery ' Stn. 675, 750–500 m.

1. *Lensia exeter*, sp. n. (Figs. 1–3.)

Anterior nectophore :—Multistriate, five groups of three ridges and transverse oral ridge. Somatocyst long. Hydrœcium deep, open on ventral side.

Localities —' Discovery ' Stations :—

Station	Net	Date	Depth in m	Specimens
100	TYF	2 x 26	475 (–0)	1
1554	TYFB	28 iii 35	1500–0	1
675	TYFV	26 v 31	750–500	1

Fig 2

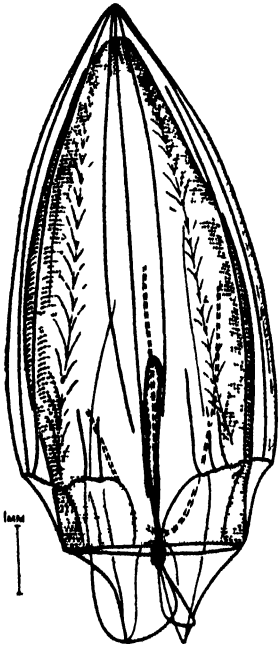


Fig 3

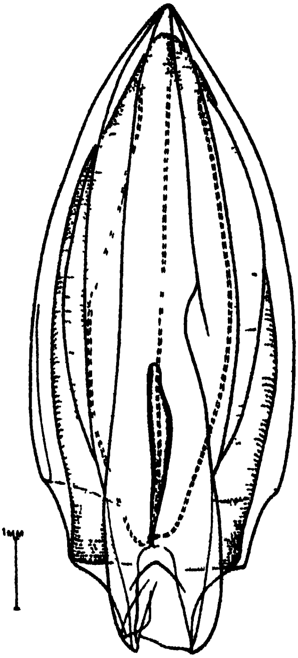


Fig 2 —*Lensia exeter*, sp n ' Discovery ' Stn 675, 750–500 m. Dorsal view.

Fig 3 —*Lensia exeter*, sp n ' Discovery ' Stn 675, 750–500 m. Ventral view

2. *Lensia ajax*, sp. n. (Figs. 4–5.)

Anterior nectophore :—5 groups of 3 (sometimes 2) longitudinal ridges. No transverse oral ridge. One of dorsal group of 3 ridges often incomplete orally, or even absent. A rudimentary ridge (or 2) present in the oral region between dorsal and lateral groups. Ridges of the two ventro-lateral groups irregular and often incomplete. Somatocyst short, oblique, spindle-shaped. Hydrœcium not extending above level of velum, open ventrally

Fig 4

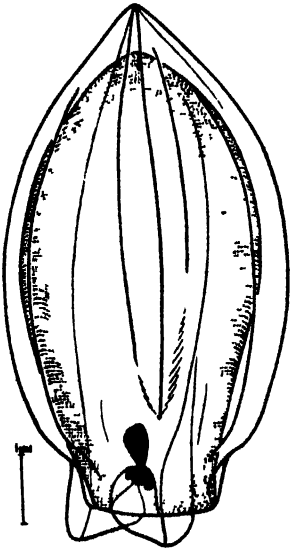


Fig 5

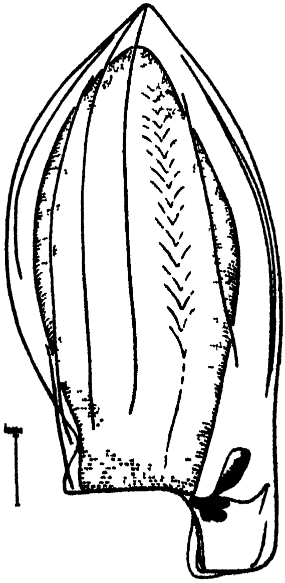


Fig. 4.—*Lensia ajax*, sp n.—'Discovery' Stn 282, 300–0 m. Dorsal view.
Fig. 5.—*Lensia ajax*, sp. n 'Discovery' Stn. 282, 300–0 m

Localities.—'Discovery' Stations :—

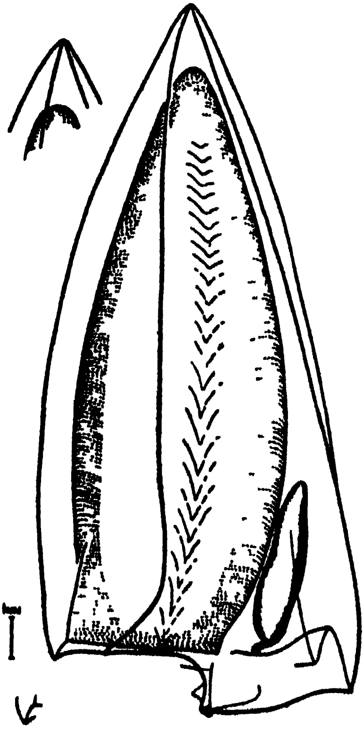
Station.	Net.	Date.	Depth in m	Specimens.
282.	TYF	12 viii 27	300–0	35
100	TYF	2. x. 21	475 (–0)	1

The specimen from St. 100 has four ridges in each group beside the two rudimentary orals on each side. It appears to be a variety of *L. ajax*.

3. *Lensia achilles*, sp. n. (Figs. 6–7.)

Anterior nectophore.—Five ridges, the dorso-laterals bending dorsad orally. Vault of hydrœcium on a level with velum, a notch present at the baso-ventral edge. Somatocyst broadly spindle-shaped A deep-water species, coloured deep or bright orange in life.

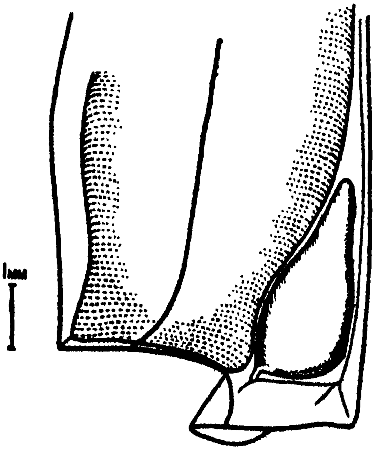
Fig. 6.



Lensia achilles, sp n ‘Discovery’ Stn. 85, 2000 (–0) m. Holotype

Localities.—This species was found at three ‘Discovery II’ stations off S W. Africa :—Stn 85, 33° 07′ 40″ S., 4° 30′ 20″ E., in an open haul from 2000 metres, 2 ant. nects. The salinity at 2000 m. was 34·88 per mille, and the temperature 2·74° C., but the specimens were not taken in a closing net. St. 100 B, closing net from 900–1000 m., 3–4. x. 1926, 2 ant. nects. St. 100 C, 33° 20′ to 33° 46′ S., 15° 18′ to 15° 08′ E., in a closing net from 2500–2000 m., 5 ant. nects. No hydrological observations are reported for that station. The salinity at that depth at a station made 20 miles away in May, 1939, was 34·88 per mille, and the temperature 2·48°–2·73° C. St. 89, 34° 05′ 15″ S., 16° 00′ 45″ E., in an open haul from 1000 m. to surface. At 1000 m. the salinity was 34·38 per mille, and the temperature 3·52° C.

Fig. 7.



Lensia achilles, sp. n. ‘ Discovery ’ Stn. 100 B, 900–1000 m. Lateral view of base of nectophore.

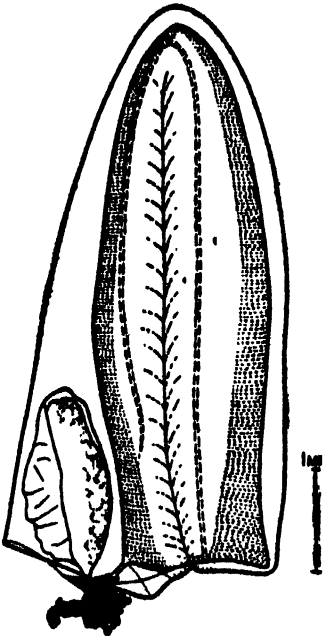
Another poor specimen was taken at St. 1571, off E. Africa, between Durban and the southern point of Madagascar at a depth of 1400–1000 m. No data about temperature or salinity are available.

4. *Lensia cossack*, sp. n. (Figs. 8–9.)

Anterior nectophore :—No crests on longitudinal ridges, except for a slight dorsal one. Ventral ridges vestigial. Basal facet horse-shoe shaped, with slight ventral notch.

No hydrœcium. Mouth-plates very short. Somatocyst ovoid, oblique, one-third the length of the neotophore when well preserved. A large specimen, 11·6 mm. in length, from St. 672 is the holotype.

Fig. 8.



Lensia cossack, sp. n. 'Carnegie Cruise' VII, Stn. 103.

Localities.—Specimens were taken, never more than in twos and threes, by 'Carnegie' at the following twenty-two stations :—

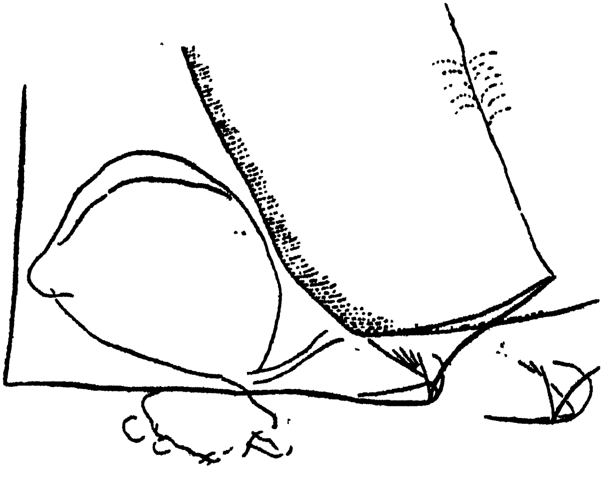
St. 16 : S 107 : B.4311
St. 24 : S 156 : B.4543
St. 49 : S 279 : B.7428
St. 52 : S 301 : B.7546
St. 55 : S 325 : B.7685
St. 56 : S 330 : B.7718
St. 82 : S 497 : B.6288
St. 87 : S 522 : B.6391
St. 88 : S 527 : B.6412
St. 91 ; S 541 : B.6491
St. 103 : S 617 : B.6835
St. 104 : S 622 : B.6856
St. 105 : S 628 : B.6886
St. 105 : S 629 : B.6898
St. 109 : S 655 : B.7915
St. 109 : S 656 : B.7927
St. 111 : S 670 : B.7983
St. 113 : S 682 : B.8044
St. 137 : S 837 : B.5498
St. 138 : S 844 : B.5525
St. 139 : S 850 : B.5570
St. 155 : S 966 : B.5871

'Discovery' Stations :—

Station.	Net.	Date.	Depth in m.	Specimens.
100 C	TYF	3. x. 26	260–310	1
282	TYF	12. viii. 27	300–0	6
701	TYFB	16. x. 31	242–0	6
708	TYFB	23. x. 31	208–0	3
709	TYFB	24. x. 31	216–0	4
711	TYFB	27. x. 31	290–0	1
713	TYFB	29. x. 31	200–0	1
968	100B	19. ix. 32	86–0	5
1371	N100B	19. v. 35	146–0	4
1372	N100B	20. v. 34	102–0	2
1567	TYFB	10. iv. 35	1350–0	1
1571	TYFB	21. iv. 35	500–0	1
672	TYFB	23. iv. 31	200–0	1
673	TYFB	25. iv. 31	340–0	1
680	TYFB	30. iv. 31	260–0	8
681	TYFV	1. v. 31	250–0	4
681	TYFV	1. v. 31	500–250	1
682	TYFB	1. v. 31	375–0	3
684	TYFV	3. v. 31	250–0	4
693	TYFV	10. v. 31	250–0	2
694	TYFB	10. v. 31	210–0	1
698	TYFB	13. v. 31	470–0	1
968	N100B	19. ix. 32	250–106	1

Stations 672–698 were all north of the subtropical convergence, but no attempt has been made yet to analyse the distribution of catches.

Fig. 9.

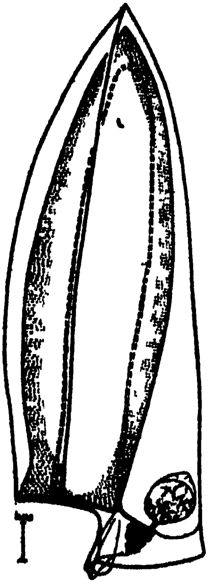


Lensia cossack, sp. n. 'Discovery' Stn. 282, 300–0 m. Lateral view of base of nectophore.

5. *Lensia hardy*, sp. n. (Fig. 10.)

Anterior nectophore :—Five complete longitudinal ridges. Hydrœcium more extensive on dorsal side than on ventral. Here it does not reach the level of the velum, except where its anterior wall slopes off into the ventral facet. Somatocyst shortly stalked, globular, tending to be bifid at apex.

Fig. 10.



Lensia hardy, sp. n. 'Discovery' Stn. 672, 200–0 m.

The species differs from *L. fowleri* in : (1) having mouth-plates more than half the diameter of mouth in length ; (2) having an extensive notch in the baso-ventral ridge ; (3) somatocyst not reaching base ; (4) having a bigger hydrœcial cavity, which extends below the base of the somatocyst.

Localities.—'Carnegie,' St. 25 : sample 162 : bottle 4564 ; 1 specimen.

'Discovery' Stns.—224 specimens were taken as follows :—

Station.	Net.	Date.	Depth in m.	Specimens.
83	N200H	21. vi. 26	650 (–0)	1
85	N450H	23. vi. 26	2000 (–0)	2
89	TYF	28. vi. 26	1000 (–0)	7
100 C	TYF	3. x. 26	260–310	18
100 D	TYF	2. x. 26	625–675	3
101	N450	15. x. 26	350–400 (–0)	1
102	N70V	28. x. 26	100–50	3
102	N70V	28. x. 26	250–100	4
247	TYF	13. vi. 27	110–115 (–0)	2
256	TYF	23. vi. 27	850-1100 (–0)	1
266	TYF	21. vii. 27	200 (–0)	16
450	N100B	12. x. 30	150 0	2
672	TYFB	23. iv. 31	200–0	3
714	TYFB	30. x. 31	246–0	69
717	TYFB	2. xi. 31	212–0	17
845	N100B	9. iv. 32	268–?	2
847	N100B	11. iv. 32	270–196	3
1370	N100B	18. v. 34	113–0	21
1749	TYFB	24. iv. 36	450–0	4
69	N70H	25. v. 26	45(0)	6
670	TYFB	21. iv. 31	470–0	1
671	TYFV	22. iv. 31	150–0	1
671	TYFV	22. iv. 31	1000–0	1
671	TYFV	22. iv. 31	500–250	1
671	TYFB	23. iv. 31	360–0	1
716	TYFB	1. xi. 31	212–0	15
839	100B	29. ii. 32	132–0	3
401	TYF	22. v. 30	1250–1300	14
453	N100B	16/17. x. 30	164–0	2

The surface water is subtropical at all of these stations except 69, 670, 671, 716, and 839, which are at the northern extremity of the subantarctic zone. At Station 401 the water at 1200–1300 m. would probably be Antarctic intermediate water. Station 453 is definitely Antarctic.

6. *Lensia hunter*, sp. n. (Figs. 11–12.)

Anterior nectophore :—Seven longitudinal ridges. The dorso-laterals do not reach the velar edge, laterals do not reach the apex but do reach base. The hydrœcium extends forward to and, on the ventral side, beyond the level of the velum, its anterior wall sloping off gradually into the ventral facet. The somatocyst is generally bilobed and asymmetrical, the left side longer than the right, ovoid and stalked. Pedicular canal horizontal. Mouth-plates without hook.

Localities.—'Carnegie,' Cruise VII, St. 64, 31° 54′ S., 88° 17′ W., 1000 m., two ant. nectophores in poor condition.

Fig. 11.

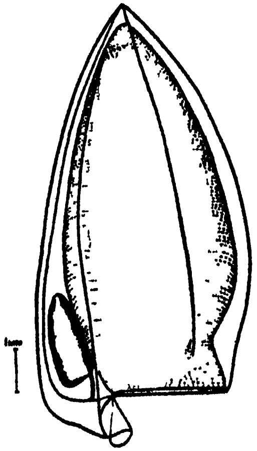


Fig. 12.

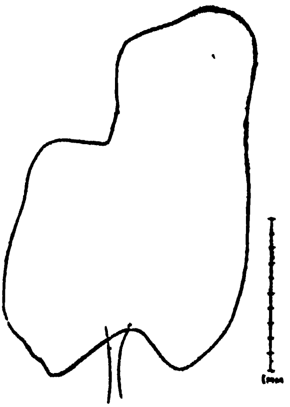


Fig. 11.—*Lensia hunter*, sp. n. 'Discovery' Stn. 1571, 1400–1000 m.
Fig. 12.—*Lensia hunter*, sp. n. 'Discovery' Stn. 1571, 1400–1000 m. Ventral view of somatocyst.

'Discovery' Stations.—

Station.	Net.	Date.	Depth in m.	Specimens.
78........	TYF	12. vi. 26	1000 (0)	24
87........	TYF	25. vi. 26	1000 (–0)	24
89........	TYF	28. vi. 26	1000 (0)	7
100........	TYF	2. x. 26	475 (–0)	2
100 A......	TYF	2. x. 26	625–675	19
100 B......	TYF	3/4. x. 26	900–1000	13
100 B......	TYF	3/4. x. 26	300–1000	7
100 C	TYF	4. x. 26	2500 (–0)	2
100 C	TYF	4. x. 26	2500–2000	7
675........	TYFV	26. iv. 31	750–500	1
675........	TYFV	26. iv. 31	1000–750	11
1569........	TYFB	12. iv. 35	1200–500	7
1571........	TYFB	21. iv. 35	1400–1000	3

7. *Lensia hotspur*, sp. n. (Figs. 13–16.)

Anterior nectophore:—Nearly twice the size of *subtiloides*, the length being about 8 mm. Five complete longitudinal ridges. The somatocyst is oblique, ovate and shortly stalked. The hydrœcium is very shallow, lying entirely below the level of the velum. The inner edges of the mouth-plate do not project below the outer ones. The pedicular canal is descending. A species allied to *L. conoidea* K. & E.

Localities.—' Carnegie ' Stations :—

Station.	Sample.	Bottle.	Specimens.
35............	205	4792	5
36............	214	4871	1
41............	237	7226	2
42............	243	7273	1
75............	464	6135	1

Discovery ' Stations :-

Station.	Net.	Date.	Depth in m.	Specimens.
89........	TYF	28. vi. 26	1000 (–0)	9
100........	TYF	2. x. 26	475 (–0)	5 dozen
100 A......	TYF	2. x. 26	625–675	8
100 B......	TYF	30. ix- 1. x. 26	0–5	8 dozen
100 C	TYF	1. x. 26	0–5	3
100 C	TYF	3. x. 26	260–310	7
100 C	TYF	4. x. 26	2500–2000	4
102........	N70V	28. x. 26	50–0	9
102........	N70V	28. x. 26	100–50	2
282........	TYF	12. viii. 27	300–0	3 dozen
446........	N100B	9. x. 30	106–0	4
448........	N100B	10. x. 30	161–0	1
671........	TYFV	27. iv. 31	2000–0	2
673........	TYFB	25. iv. 31	340–0	2
677........	TYFV	27. iv 31	250–0	1
679........	TYFV	29. iv. 31	250–0	2
682........	TYFB	1. v. 31	375–0	3
687........	TYFV	5. v. 31	250–0	1
690....... .	TYFV	7. v. 31	250–0	7
691........	TYFB	8. v. 31	400–0	1
693........	TYFV	10. v. 31	250–0	1
694........	TYFB	10. v. 31	210–0	1
698........	TYFB	13. v. 31	470–0	3
699........	TYFV	14. v. 31	250–0	1 dozen
702........	TYFB	17. x. 30	236–0	19
708........	TYFB	23. x. 31	208–0	3
709........	TYFB	24. x. 31	216–0	2
842........	N100B	3. iii. 32	155–0	3
967........	100B	19. ix. 32	306–145	1
1371........	N100B	19. v. 31	146–0	1

Fig. 13.

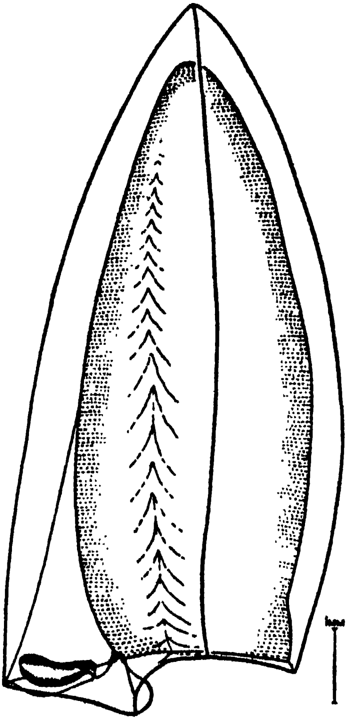


Fig. 14.

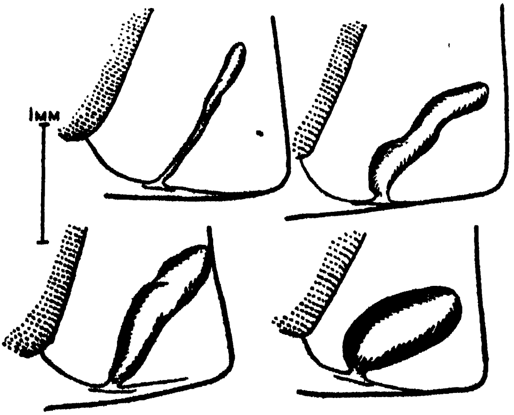


Fig. 13.—*Lensia hotspur*, sp. n. 'Carnegie' Cruise VII, Stn. 36.
Fig. 14.—*Lensia hotspur*, sp. n. 'Discovery' Stn. 100, 475 (–0) m.
Lateral view of somatocysts.

Fig. 15.

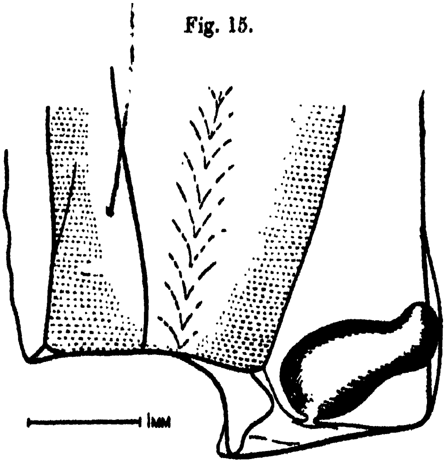


Fig. 16.

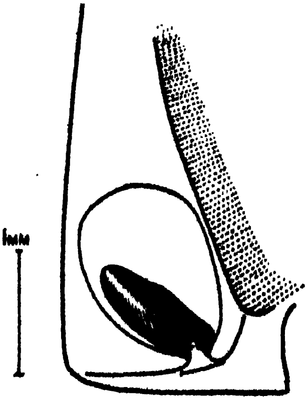


Fig. 15.—*Lensia hotspur*, sp. n. 'Discovery' Stn. 89, 1000 (–0) m. Lateral view of base of nectophore.

Fig. 16.—*Lensia hotspur*, sp. n. 'Discovery' Stn. 100 A, 0–5 m. Lateral view, showing former extent of somatocyst.

8. *Lensia havock*, sp. n. (Figs. 17–19.)

Anterior nectophore:—Seven complete ridges, laterals bending ventrad below to run onto mouth-plate. Hydrœcium extends up above level of velum. Ventral wall with pronounced slit extending up to upper limit of hydrœcium. Somatocyst spindle-shaped.

Two specimens taken by Dr. Beebe off Bermuda in 1931 were identified by me as belonging to a new species with seven ridges. In the paper which Beebe published under my name he wrongly called this species *multicristata* Moser, 1925, probably because it had seven ridges.

Localities.—Third Bermuda Oceanographic Expedition:—

Catalogue no.	Net.	Date.	Depth in m.	Specimens.
311780....	1258	17. viii. 31	1046	1
311415....	1195	3. ix. 31	1463	1

Further details will be found in 'Zoologica,' N.Y., xiii. nos. 1–3.

'Discovery' Stations:—

Station.	Net.	Date.	Depth in m.	Specimens.
71......	TYF	30. v. 26	2000 (–0)	1
78......	TYF	12. vi. 26	1000 (–0)	2
85......	N450H	23. vi. 26	2000 (–0)	1
89......	TYF	28. vi. 26	1000–0	5
100 A....	TYF	2. x. 26	625–675	3
100B	TYF	3/4. x. 26	900–1000	8
100 C ...	TYF	4. x. 26	2500 (–0)	2
100 C ...	TYF	4. x. 26	2500–2000	4
401......	TYF	22. v. 30	1250–1300	1
661......	TYFV	2. iv. 31	1000–750	1
661......	TYFV	2. iv. 31	3000–2000	3
666......	TYFV	17. iv. 31	2000–1500	1
671......	TYFV	21. iv. 31	1500–1000	2
1571......	TYFB	21. iv. 35	1400–1000	2
1917......	TYFB	3. xii. 36	1400–1000	1

Fig. 17.

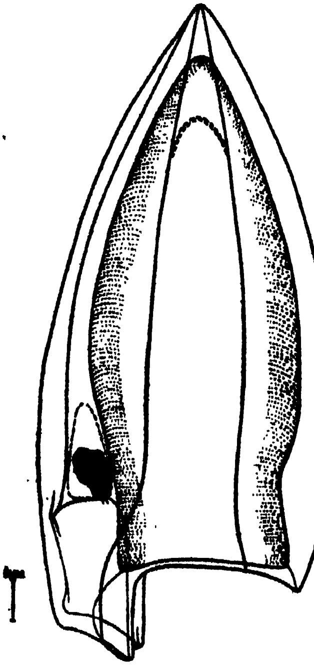


Fig. 18.

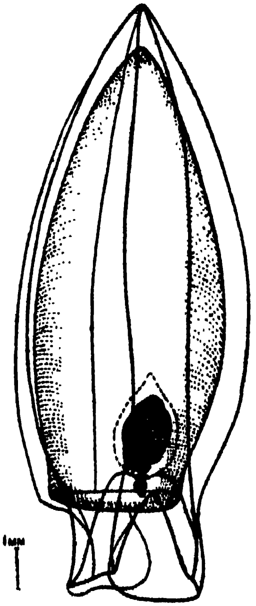


Fig. 19.

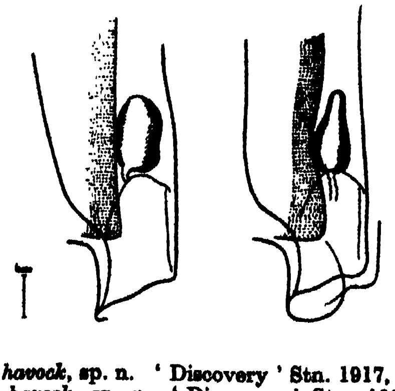
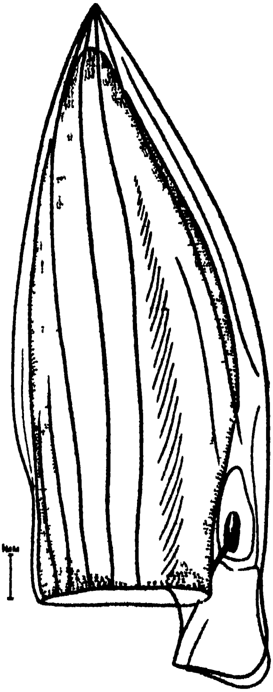


Fig. 17.—*Lensia havock*, sp. n. ' Discovery ' Stn. 1917, 1400–1000 m.
Fig. 18.—*Lensia havock*, sp. n. ' Discovery ' Stn. 100 C, 2500–0 m. Ventral view.
Fig. 19.—*Lensia havock*, sp. n. ' Discovery ' Stn. 100 B, 900–1000 m. Lateral view of somatocysts.

9. *Lensia hostile*, sp. n. (Figs. 20–22.)

Anterior nectophore: —Large, 15·5 mm. overall. Hydrœcium deep, an open slit on ventral side. Somatocyst heart-shaped, apex uppermost. Most of ridges uninterrupted from apex to oral edge, some incomplete, and only seen at oral end and in mid-region.

Fig 20.



Lensia hostile, sp. n. 'Discovery' Stn 1743, 2100–1150 m.

A dorsal group of three or four ridges cut off from oral edge by two converging grooves, two dorso-lateral groups of 3 or 4, and two ventro-lateral groups of 3 or 4.

Localities.—' Discovery ' Stations :—

Station.	Net.	Date.	Depth in m.	Specimens.
89......	TYF	28. vi. 26	1000 (–0)	1
1571.....	TYFB	21. iv. 35	1400–1000	2
1739.....	TYFB	17. iv. 36	3000–2000 (–0)	1
1743.....	N450B	20. iv. 36	2100–1150	1

Fig. 21.

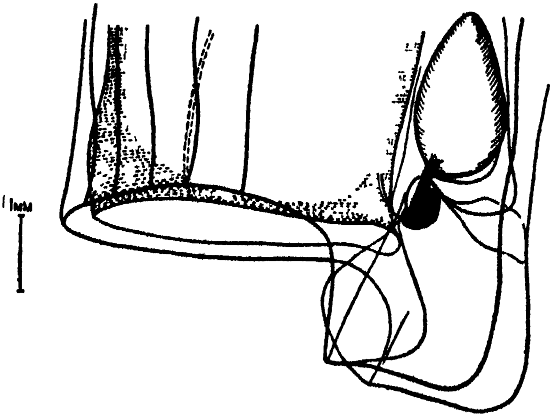


Fig. 22.

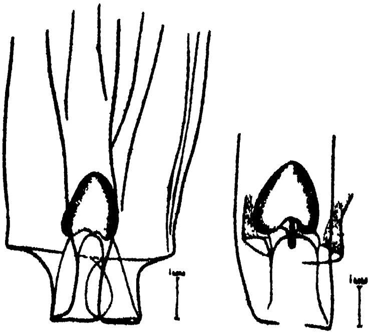


Fig. 21.—*Lensia hostile*, sp. n. ' Discovery ' Stn. 1743, 2100–1150 m. Base of nectophore.

Fig. 22.—*Lensia hostile*, sp. n. ' Discovery ' Stn. 1571, 1400–1000 m. Ventral views of base of nectophore and of hydrœcium and somatocyst.

10. *Lensia lelouveteau*, sp. n. (Figs. 23–25.)

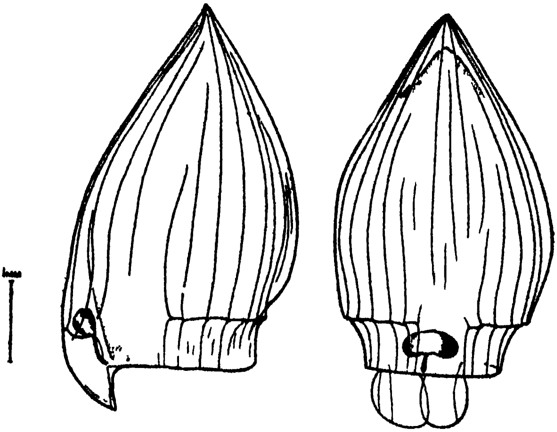
Syn.: *Lensia multicristata* (Moser) forme *grimaldii* Leloup, 1934 (part), non *L. grimaldii* Leloup, 1933.

L. lelouveteau is a small multistriate species. The ridges of the anterior nectophore are in five groups, three or more dorsal, seven or eight lateral and four to six ventro-lateral. Velar ridge present. The somatocyst is squat and kidney-shaped. Ventro-basal margins of bell well rounded.

The seven specimens on which I base the species *L. lelouveteau* are :—

'Discovery' Station 100, net TYF, fished open from 475 metres to the surface, 1 anterior nectophore, the holotype (7·8 mm.). Station 282, 300 m. to surface (open), 1 ant. nect.

Fig. 23.



Lensia lelouveteau, sp. n. 'Meteor' Stn. 246, 1000–800 m.

'Meteor' Stn. 208, 100–50 m., 1 ant. nect. (3·1 mm.). Stn. 246, 1000–220 m., 1 ant. nect. (5·2 mm.). Stn. 277, 600–400 m., 3 ant. nect., one figured by Leloup, 1934 (5·7 mm.).

There has arisen some confusion connected with the name *grimaldii*. *L. grimaldii* is a good species which

I have redescribed below. The 'Meteor' material labelled *L. multicristata* forme *grimaldii* is contained in fourteen small tubes labelled by Leloup. I studied

Fig. 24.

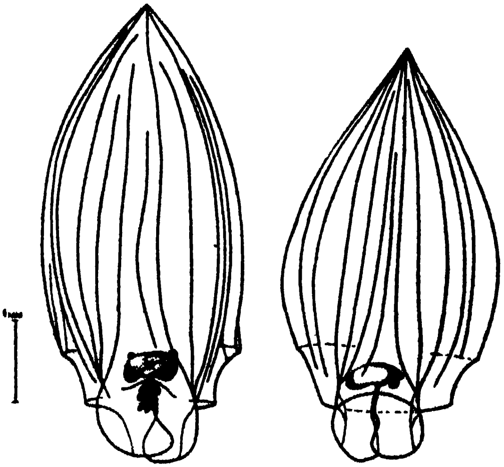


Fig. 25.

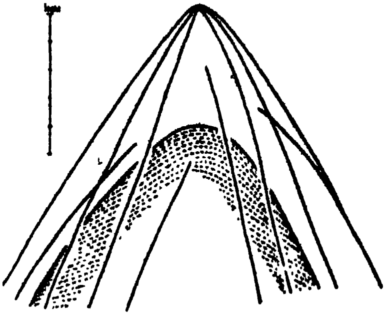


Fig. 24.—*Lensia lelouveteau*, sp. n. Left, 'Meteor' Stn. 277. Right, 'Meteor' Stn. 246, 1000–800 m. Ventral views.

Fig. 25.—*Lensia lelouveteau*, sp. n. 'Meteor' Stn. 246, 1000–800 m. Lateral view of apical part of nectophore.

these on Jan. 9, 1940. Four contained specimens that had dried up at some time and are no longer identifiable. None of the others contained specimens of either *L. grimaldii* Leloup, 1933, or *L. multicristata* Moser. 1925. Two contained specimens of *L. ajax*, one a specimen of *L. exeter*, one a specimen of *L. hostile*, two specimens of *L. lelouveteau* ; and another, which at one time contained the three specimens of the species that I have described as *L. lelouveteau*, figured by Leloup, 1934 (fig. 3), contained only the label. Dr. Leloup kindly sent the specimens themselves to me, and I examined them on January 22, 1940. The three remaining tubes contained specimens of what is perhaps a still further new species, a small *Lensia*, multistriate and without a velar ridge. Lack of material prevents precise description of it.

11. *Lensia grimaldii* Leloup, 1933. (Figs. 26–29.)

I was familiar with good specimens of this species under the manuscript name *duplex* some years before Leloup published a description and figures of one very poor, much lacerated and collapsed specimen with fragmentary nectosac. Through the courtesy of Dr. Leloup I was able to examine his holotype on Dec. 23, 1933. Although his figures are necessarily not very representative, I am satisfied that his name *grimaldii* must now be applied to the species figured below. Unlike *exeter*, the number and condition of the ridges is pretty constant. The species would appear to be a mid-water form.

With Leloup's later suggestion (Bull. Mus. Roy. d'Hist. Nat. Belg. x. 6, p. 38) that *grimaldii* does not represent a good species, but is only a variety of *Lensia multicristata* (Moser), I disagree. The one species is quite distinct from the other ; and amongst the many specimens I have examined no intermediates have been found. Neither species has any connection with yet another described and figured by Leloup (*loc. cit.*, pp. 37–40) as *Lensia multicristata* forme *grimaldii*, taken at ' Meteor ' Station 277. The combination of characters, small size, number of longitudinal ridges, presence of horizontal (velar) ridge, shape of baso-ventral angle and size and shape of somatocyst mark these last-mentioned specimens out as belonging to a distinct species, described by me under the new name *lelouveteau*, and represented by specimens taken by ' Discovery II.'

It is convenient to describe anterior nectophores like those of *L. grimaldii* in terms not of ridges and facets but of infoldings between outward ridges. These outward ridges bear one or more longitudinal crests. When the muscular nectosac contracts in swimming, the semi-rigid chitinous investment has to fold inwards like the cover between the ribs of an umbrella, and then have enough elasticity to expand the nectosac again. Here we have a mechanism the habitual functioning of which lends itself to evolutionary change.

Fig. 26.

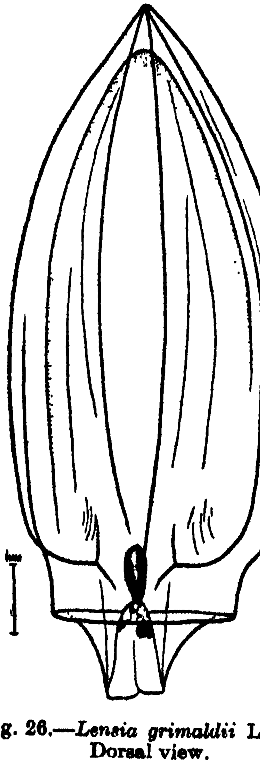


Fig. 27.

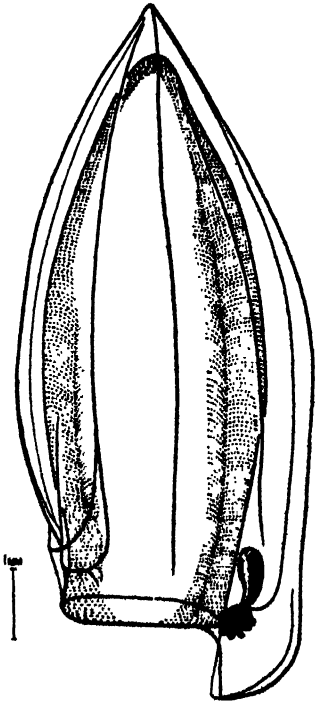


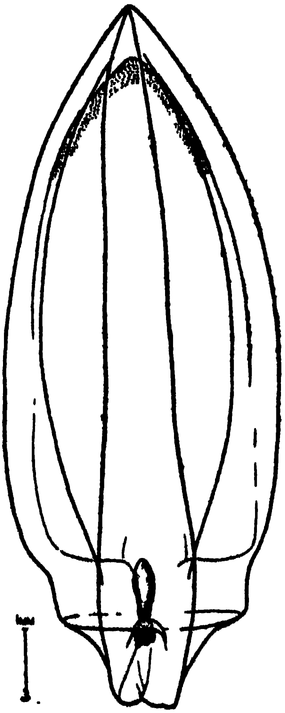
Fig. 26.—*Lensia grimaldii* Leloup. 'Discovery' Stn. 282, 300–0 m. Dorsal view.

Fig. 27.—*Lensia grimaldii* Leloup. 'Discovery' Stn. 282, 300–0 m.

There is a pair of dorsal crests on a dorsal ridge that is flanked by two longitudinal infoldings, 'B and B' of Leloup's fig. 6. It can be seen that on contraction the folds converge orally and cut off the ridge and crests.

The two lateral ridges, each bearing two crests, are flanked by the antero-lateral and postero-lateral infoldings ('B B' and 'D D' of Leloup's fig. 6), while the rigid ventral area is separated from the lateral ridges by the same postero-lateral infoldings marked 'D and D' in Leloup's fig. 6. All the infoldings are longitudinal.

Fig. 28.

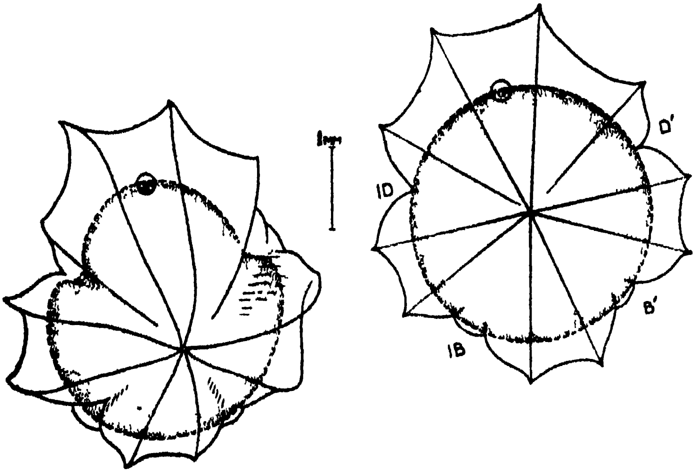


Lensia grimaldi Leloup. 'Discovery' Stn. 282, 300–0 m. Ventral view.

Viewed from the apex the dorso-ventral axis of the neotophore is longer than the latero-lateral axis, and not as shown by Leloup's figs. 6–9.

Sometimes the right, sometimes the left dorsal ridge is the longer. Occasionally a third incomplete ridge is present, extending half-way up to the apex. As a constant character the ventral pair of ridges does not reach the apex.

Fig. 29.



Lensia grimaldii Leloup. 'Discovery' Stn. 282, 300–0 m. Left, apical view. Right, diagrammatic apical view.

Localities.—'Carnegie' Station: Cruise VII. St. 64. S. 397 : B. 7081. 1 specimen.

'Discovery' Stations :—

Station.	Net.	Date.	Depth in m.	Specimens.
89........	TYF	28. vi. 26	1000 (–0)	1
100 C	TYF	2. x. 26	450–550	1
100 C	TYF	4. x. 26	2500–2000	2
282........	TYF	12. viii. 27	300–0	10
690........	TYFV	7. v. 31	1500–0	2
699........	TYFV	14. v. 31	500–250	1

XV.—*Fossil Plants from East Greenland.*

By Sir Albert C. Seward and W. N. Edwards.

[Plate III.]

In the course of his expedition to the Kangerdlugssuak region of East Greenland in 1935–36, Dr. L. R. Wager, of Reading University, was fortunate enough to find an interesting series of plant remains in sediments below the local base of the basalts on the west side of Christian IV. Glacier at a point which was named Coal Corner (68° 50′ N., 30° 50′ W.). We are indebted to Dr. Wager for notes (incorporated below) on the occurrence of these fossils. A small collection was made during a journey to the highest mountain of the region in 1935 (see Courtauld, 1936, p. 201), and a further small collection was made by Dr. H. G. Wager during a journey for botanical purposes in 1936 (Wager, L. R., 1937, pp. 411 and 415 and map).

Wager states that the sandstone in which the plant remains are found was associated with sandy shales and that fragments of coal were obtained from scree near by. These sediments occur near the top of a variable series found at many points between Coal Corner and Miki Fjord, which lies 50 miles to the S.S.W. Less well-preserved fragments of plants were found elsewhere in the series, and no doubt further search would produce a larger and more satisfactorily preserved collection.

At a low horizon in the series a few belemnites were found indicating a marine phase. These have been examined by Prof. H. H. Swinnerton, who concludes that they are of Senonian age. The geological evidence obtained in the field suggests that the sediments at Coal Corner which contain the plant remains succeeded the Senonian marine horizon with no great interval of time.

The stratigraphical evidence further indicates that basalts had already been poured out in the Miki Fjord region when the plant-bearing sandstones were deposited, and it is worthy of note that a conglomerate of rolled basalt pebbles is associated with the coal-bearing deposit from the scree. Thus the plant-bearing deposits of Coal Corner are contemporaneous with the beginning of basalt extrusion in this part of East Greenland. Several kilometres of basalts were poured out after the plant-bearing sediments of Coal Corner were formed, and the Cape Dalton Eocene sediments mentioned below were deposited late in the period of time indicated by the accumulation of this great thickness of basalts. An account of the stratigraphy of this part of East Greenland has already been prepared by L. R. Wager and is awaiting publication in the Danish journal, 'Meddelelser om Grønland.'

The collection of plant-remains to be described is not extensive, and the preservation in a rather coarse sandstone matrix is not particularly good, but, in addition to the botanical interest, the assemblage is of importance because it can be correlated with other Arctic and northern floras of known or presumed Eocene age, and particularly with the long-known early Tertiary flora of western Greenland.

Sequoia langsdorfii (Brongn.). (Pl. III. fig. 10.)

This conifer, which is widely distributed in Arctic and other regions in the Eocene, and also occurs in rather later rocks, is the commonest species in Mr. Wager's collection. It is represented by sterile twigs only, and it is just possible that some of the less well-preserved impressions should be referred to *Taxodium distichum miocenum* Heer. Both species are abundant in the Tertiary sediments of West Greenland. "*Taxodium* sp." has been recorded by Mathiesen (1932, p. 57) from Eocene beds on Sabine Island in East Greenland.

Elatocladus sp. cf. *E. ungeri* (Heer). (Pl. III. fig. 9.)

One fragment of a coniferous twig, with rather falcate and almost appressed leaves, is too small to name with any degree of confidence. It is possibly referable either to *Sequoia couttsiæ* Heer or, more probably, to a species of rather doubtful value named *Glyptostrobus ungeri* by Heer and now usually referred to the form-genus *Elatocladus* (see Seward & Conway, 1935, p. 14, pl. i. fig. 8). *E. ungeri* was originally described from Western Greenland.

Platanus sp.

There is a single leaf impression closely comparable with a leaf figured by Heer from Unartok, West Greenland

(1883, pl. xcix. fig. i) as *P. guillelmæ* Goepp. Similar leaves from Greenland had formerly been described by Heer as *P. aceroides*, but the nomenclature of early Tertiary species of plane is much confused, and isolated specimens can rarely be identified satisfactorily. Some fragmentary impressions of bark from Coal Corner (Pl. III. fig. 8) are also very probably referable to the genus *Platanus*. Bark of a similar type from the Mackenzie River, Canada, was described by Heer as *Betula* sp. (1868, pl. xxiii. fig. 10), but this also might possibly be *Platanus*.

Cercidiphyllum richardsoni (Heer). (Pl. III. figs. 1, 2.)

There are several imperfect specimens of the leaves of this tree; one of them (Pl. III. fig. 1) shows the arrangement of the main veins and others (Pl. III. fig. 2) show the large crenations of the margin which are the most obvious and distinctive character of the species.

Originally described as a *Populus*, these leaves are now usually referred to the genus *Cercidiphyllum*, the kadsura tree of China and Japan. Fossil occurrences of *Cercidiphyllum* have recently been admirably summarized by R. W. Brown (1939), who shows that leaves probably belonging to this genus have in the past been referred to no fewer than twenty-two different genera. In view of the great variability of the leaves in the only living species, and the extreme confusion among the numerous fossil forms, which range from the lower Cretaceous to the Miocene, there may well be differences of opinion as to the appropriate name in individual cases. Brown's careful analysis, leading to a division into five nominal species, merits the closest attention and is doubtless in the main well founded. Brown includes "*Populus*" *richardsoni* in *Cercidiphyllum arcticum* (Heer); for the present, however, it would seem better to keep these two distinct. The former is distinguishable by its greater average size, its larger crenations, and its more delicate texture, reflected in an almost invariably more fragmentary state of preservation. A leaf of the smaller species has been figured from Sabine Island by Mathiesen (1932, p. 60).

Brown gives the range of his comprehensive *C. arcticum* as Palæocene to middle Eocene. *C. richardsoni* is known from the Mackenzie River, Canada; Alaska; West

Greenland; Spitsbergen; Eastern Asia; and from Mull (Seward, 1939, p. 22), all in beds of presumed Eocene age. Appropriately enough, in view of its discovery in East Greenland by Dr. L. R. Wager, of Reading University, it is also found in beds of known lower Eocene age at Reading, England, for an unnamed leaf figured by Hooker (1854, pl. iv. fig. 2) together with other specimens now in the Geological Department of the British Museum (Natural History) are undoubtedly referable to this species.

Fruits of Cercidiphyllum. (Pl. III. figs. 3–6.)

Wager obtained several specimens (casts) which are closely comparable with some of those figured by Brown as "fruits associated with *Cercidiphyllum arcticum*" (1939, pl. liv. figs. 12, 13). The East Greenland specimens are from 15–23 mm. in length, and from 8–11 mm. in width at the broadest part. They are transversely wrinkled or striated, with a very distinct longitudinal furrow (or ridge) along one side. Complete specimens are slightly more pointed at one end than the other.

Brown makes out an extremely good case for regarding these and similar fruits as belonging to *Cercidiphyllum*, and in many of the localities in which the leaves and fruits are associated he has also found small winged seeds closely resembling those of the living *C. japonicum*. Although no seeds have been found in the coarse matrix of the East Greenland sediments, the association of leaves and fruits provides further support for Brown's conclusion. The same type of fruit (generically if not specifically identical) is known from Atanekerdluk, West Greenland, under the name of *Nyssa arctica* (Heer, 1869, p. 477, pl. xliii. fig. 12 *c*; pl. l. figs. 5–7). Furthermore, the specimens from Reading figured by Hooker (1854, pl. iv. figs. 24–26), together with others subsequently collected by Starkie Gardner but not yet described, are also clearly similar to some of those figured by Brown.

Palæanthus sp. (Pl. III. fig 7.)

This imperfectly preserved fossil is probably a fertile shoot, but it is impossible to say of what nature. For convenience it may be referred to Newberry's form-genus

Palæanthus. Its value lies mainly in its resemblance to other fossils of uncertain affinity from Arctic regions. Heer, for example, figured a similar fossil from Greenland (1882, pl. iv. figs. 1–7) as *Zamites globuliferus*, though what that is no one knows, and comparison may also be made with *Nordenskioldia borealis* from Spitsbergen (Heer, 1870, p. 65, pl. vii. figs. 1–13). The closest resemblance is perhaps to a specimen from West Greenland named *Palæanthus hollicki*, by Seward & Conway (1935, p. 35, pl. ii. figs. 13, 14).

Incertæ sedis.

The collection also included some poorly preserved and indeterminable coniferous wood; a single specimen of a small rounded seed or fruit; and fragmentary dicotyledonous leaves belonging to several species. One of these imperfect leaves resembles *Corylus macquarriei* (Forbes), a common fossil in the West Greenland deposits and already recorded from Sabine Island by Mathiesen (1932). Another is of the *Quercus* or *Fagus* type, and it is noteworthy that Mathiesen mentions (1932, p. 5) fragmentary leaf impressions of "a species of beech?" in the Cape Dalton beds.

The Age and Relationships of the East Greenland Basaltic Flora.

Tertiary plant fossils have previously been found at four different points in East Greenland: Cape Dalton, Turner Sound, Cape Brewster, and Sabine Island. Wager's valuable discovery adds a fifth locality. The earlier records, and the field relations of the sediments, have been summarized by Koch (1929, p. 201; 1929 *a*, p. 208), and the plants themselves have been fully described by Mathiesen (1932). The Cape Dalton sediments were subsequently re-investigated by Wager (1935), whose additional collection of fossil plants is in Mathiesen's hands. The first three localities yielded fossil wood only, except for a few obscure leaf impressions, and that from Cape Brewster was too ill-preserved for identification. A conifer of the *Cedroxylon* type was recorded from Turner Sound, while from Cape Dalton Mathiesen described three dicotyledons, which he named *Tetracentronites hartzi*, *Corylopsites grœnlandicus*, and *Platanites* sp. The second of these was found to be structurally very close indeed to the wood of the living *Cercidiphyllum japonicum*, though on balance Mathiesen thought that it was more probably related to *Corylopsis* (family Hamamelidaceæ). In view of recent work confirming the widespread abundance of *Cercidiphyllum* in early Tertiary floras, and its occurrence at Sabine Island and at Christian IV. Glacier (Coal Corner), the possibility that this wood may after all belong to the genus *Cercidiphyllum* must certainly be borne in mind.

The importance of the Cape Dalton flora, including the petrified woods, lies in its occurrence in marine strata associated with a considerable fauna, regarded by Ravn as similar to some of the Eocene faunas of England and France. Thus the "*Cœloma* Bed" of Cape Dalton is compared with the London Clay, and the "*Cyrena* Bed" with the Sables de Cuise and the Bagshot Beds (Ravn, 1904, p. 138). Wager (1935) has shown that the basalts in the Cape Dalton area are earlier in age than the sediments, and that there was only a short interval between the extrusion of the highest basalt and the deposition of the sediments. The latest basalts of Cape Dalton must therefore be earlier than Middle Eocene and may well be Lower Eocene. The plant-bearing sediments in the Kangerdlugssuak region are very much lower in the basaltic series; indeed, in the whole basaltic province plant fossils have so far been found mainly between the earlier flows or even beneath the basalt. All these plant assemblages are therefore not strictly contemporaneous, though no great floral differences have yet been detected. The belemnites mentioned above definitely suggest a post-Senonian age for the Kangerdlugssuak flora, and this is in general agreement with other faunal evidence from West Greenland.

The few leaf-impressions from Sabine Island, including *Ginkgo*, *Taxodium*, monocotyledons resembling *Typha* and *Carex*, *Corylus macquarriei*, *Cercidiphyllum arcticum*, and *Acer arcticus*, as well as those here described from Christian IV. Glacier (Coal Corner), may all be very closely matched in the more extensive floras of West Greenland and of other Arctic regions. We agree with Koch and Mathiesen, and with earlier writers such as Starkie Gardner, in regarding all these floras as in the main of very early Eocene age. Whether some of them may be uppermost Cretaceous rather than lowest Eocene cannot yet be decided. The plants suggest a temperate and probably a moist climate.

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EXPLANATION OF PLATE III.

All the photographs (by M. G. Sawyers) are untouched and of natural size. The specimens are in the Geological Department, British Museum (Nat. Hist.).

Fig. 1. *Cercidiphyllum richardsoni*, leaf. V. 26793.
Fig. 2. *Ibid.*, fragment of leaf showing crenate margin. V. 26794.
Fig. 3. *Cercidiphyllum* fruit. V. 26795.
Fig. 4. Reverse side (removed from the rock) of the fruit shown in fig. 3.
Figs. 5, 6. Isolated fruits of *Cercidiphyllum*. V. 26796–97.
Fig. 7. *Palæanthus* sp. V. 26798.
Fig. 8. ? *Platanus* sp., fragment of bark. V. 26799.
Fig. 9. *Elatocladus* sp., cf. *E. ungeri*. V. 26792.
Fig. 10. *Sequoia langsdorfii*. V. 26790.

XVI.—*Notes on the Plectognath Fishes.*—VI. *A Synopsis of the Genera of the Family* Aluteridæ, *and descriptions of Seven new Species.* By A. Fraser-Brunner.

The division Balistiformes of the suborder Balistoidea consists of two families, which are separable as follows :—

I. Palatine T-shaped, the foot of the T movably articulated with the ectopterygoid. 8 outer teeth in each jaw ; 6 inner ones in upper jaw. 2 or no caudal vertebræ with epipleurals. 5 precaudal interneurals* ; 4 forming trough for spinous dorsal fin, the 1st movably articulated between exoccipitals, the others free from skull ; the 5th forming a prop between trough and vertebral column. Distal ends of caudal interneurals and interhæmals not expanded. 3 dorsal spines. Scales moderate or small, in regular series, imbricate. All soft fins with branched rays .... **Balistidæ.**

II. Palatine a simple bar, not directly connected with ectopterygoid. 6 outer teeth in each jaw ; 4 inner ones in upper jaw. 4 or 5 caudal vertebræ with epipleurals. 3 precaudal interneurals* fused to form trough for spinous dorsal fin, immovably attached to exoccipitals, unconnected with vertebral column. Distal ends of caudal interneurals with prominent lateral expansions. Normally 2 dorsal spines, the second very small and sometimes absent. Scales small or minute, not in regular series, rarely in contact. Soft dorsal, anal and pectoral rays simple .... **Aluteridæ.**

Despite the large material which I have been able to study, I have had great difficulty in arranging the species of Aluteridæ into genera capable of clear definition, owing partly to the paucity of useful taxonomic characters and partly to the number of inadequate descriptions that abound in the literature. Nevertheless, the majority of the latter are now satisfactorily accounted for, and careful study of the specimens at hand has enabled me to compile the following practical key, which, though artificial in itself, defines what I believe to be natural genera.

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* Excepting one, which may be thickened, in series with the caudal interneurals, in front of soft dorsal fin.

Synopsis of the Genera.

I. No fleshy barbel on lower jaw. 19–21 vertebræ .... ALUTERINÆ.

A. Movable pelvic spine present. 19 vertebræ.

1. First dorsal spine originating over middle or front of eye, bearing 2 rows of small, upwardly-directed barbs on its anterior face, and a row of stronger downwardly-directed ones on each posterior edge. Scales small, each with a row of backwardly-directed spinules on hind edge, those on side of tail bearing bristles. Pelvic shield and spine relatively large, with strong barbs. Ventral flap small .... 1. *Pervagor*.

2. First dorsal spine originating behind middle of eye.

a. Each scale on side with many spinules, several of which may be longer than the others. No retrorse spines on caudal peduncle. Ventral flap small.

i. Dorsal spine with strong barbs on anterior face as well as on posterior edges. Scales with numerous minute spinules arising directly from basal plate ...... 2. *Laputa*.

ii. Dorsal spine with barbs on posterior edges only (sometimes obsolete), the anterior face bearing asperities like those on body.

α. Spinules on scales arising directly from basal plate. Pelvic spine slender, tapering. No caudal bristles .... 3. *Paramonacanthus*.

β. Spinules on scales borne on a pedicle. Pelvic spine short, quadrate. Caudal bristles usually developed .... 4. *Stephanolepis*.

b. Each scale on side with one strong central spinule, sometimes with smaller ones at base.

i. Caudal peduncle without retrorse spines. Ventral flap small or moderate. Dorsal spine usually with barbs on anterior face as well as on posterior edges.

a. Pelvic shield relatively large, quadrate, strongly spinate. Soft dorsal and anal fins not elevated anteriorly. Dermal filaments greatly developed. Scales relatively large and coarse, those of front half of body arranged transversely, those of posterior half longitudinally .... 5. *Chætoderma*.

Pelvic shield and spine small, tapering, moderately spinate on the edges. Soft dorsal and anal fins somewhat elevated anteriorly. Dermal filaments scarcely developed or absent. All scales, except on head, arranged in distinct longitudinal tracts .... 6. *Arotrolepis*.

ii. Caudal peduncle with 4 to 6 retrorse spines on basal plates. Ventral flap greatly developed. Dorsal spine with barbs only on posterior edge .... 7. *Monacanthus*.

B. No movable pelvic spine.

1. 20 vertebræ. Anal rays less than 40.

a. First dorsal spine fully erectile, locked by a second (rudimentary) spine when raised.

i. Pelvis strong, reaching nearly to vent. Belly not greatly distensible.

a. Pelvic shield present at all stages (sometimes minute or inconspicuous).

* First dorsal spine originating behind middle of eye.

† Postero-lateral barbs of dorsal spine larger than those (which may be obsolete) on its anterior face; the spine not contained in a groove when depressed.

‡ Gill-opening behind eye. Dorsum high. Caudal peduncle with bristles, which are long, curved and movable in males. Ventral flap moderately developed, supported by projection of pelvis. Form short and deep. Small species .... 8. *Rudarius*.

‡‡ Gill-opening below eye. Dorsum low. No caudal bristles, but antrorse spines may occur on

caudal peduncle. Ventral flap scarcely or not developed, pelvis not projecting. Form oblong. Large species . . 9. *Navodon.*

†† Dorsal spine 4-angled, the barbs on its anterior face as large as, or larger than, those on posterior edges; the spine contained in a groove when depressed. No ventral flap. Sometimes a patch of bristles on side of tail, between soft dorsal and anal fins, or spines on caudal peduncle, in males . . . . 10. *Acanthaluteres.*

** First dorsal spine originating above or before middle of eye. Postero-lateral barbs longer than those on anterior face (when barbs are present).

† Snout not produced; mouth terminal.

‡ Each scale with a strong central spinule supporting a mushroom-like expansion. Ventral flap moderately developed . 11. *Scobinichthys.*

‡‡ Scales not bearing mushroom-like expansions.

§ Pelvic shield moderately or well developed. Ventral flap present.

‖ Gill-opening mostly before middle of eye. Dermal filaments more or less developed. Dorsal spine over middle of eye, not contained in a groove when depressed. 3 small spines on lower half of tail, in females . . . . 12. *Pseudomonacanthus.*

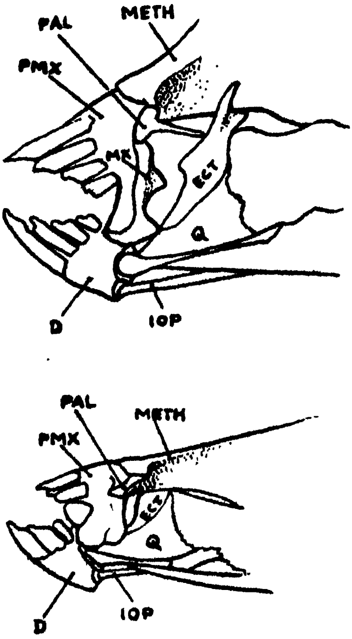
‖‖ Gill-opening below or behind middle of eye. No dermal filaments. Dorsal spine contained in a groove when depressed.

¶ Scales comparatively large, each with a raised prominence bearing 2 rows of spinules. Gill-opening below eye. Caudal peduncle with 2 pairs of straight, movable spines . 13. *Meuschenia.*

¶¶ Scales small or minute, each with small spinules in 1 or 2 rows. Gill-opening mostly behind middle of eye. Side of tail with bristles or spines in males . 14. *Amanses.*

§§ Pelvic shield minute, inconspicuous. No ventral flap. Each

Fig. 1.



Jaws of *Balistes* (above) and *Monacanthus* (below). D, dentary; ECT, ectopterygoid; IOP, interoperculum; METH, mesethmoid; MX, maxillary; PAL, palatine; PMX, premaxillary; Q, quadrate.

scale with cluster of slender spinules. Gill-opening below eye .. 15. *Eubalichthys.*

†† Snout produced; mouth dorsal. Dorsal spine with barbs, contained in a groove when depressed. Pelvics projecting, supporting small ventral flap. 16. *Oxymonacanthus.*

β. Pelvic shield absent. Dorsal spine originating over hind part of eye, bearing 4 rows of strong barbs .... 17. *Blandowskius.*

ii. Pelvis feeble, reaching little more than halfway to snout. Belly greatly distensible. Dorsal spine without barbs. Form short and deep .... 18. *Brachaluteres.*

b. First dorsal spine not fully erectile, enveloped in a loose flap of skin which binds it to back; it originates behind eye and lacks barbs. Pelvis feeble, reaching less than halfway to vent; no pelvic shield. Bristles and spines on side of tail. No ventral flap; belly slightly inflatable .... 19. *Paraluteres.*

2. 21 vertebræ. Anal rays 40 or more.

a. Dorsal spine originating over middle of eye, feeble and unarmed in adults, stronger in young. Pelvic shield absent, at least in adults .. 20. *Alutera.*

b. Dorsal spine well in advance of eye. Snout short; form oblong; caudal peduncle slender. Pelvic shield minute; no ventral flap .... 21. *Pseudalutarius.*

II. A fleshy barbel on lower jaw. 30 vertebræ. ANACANTHINÆ. Dorsal spine very feeble, setiform, above hind-margin of orbit. Soft dorsal rays 48–50, anal rays 58–62. Pelvis very slender and feeble, sometimes supporting a small ventral flap. Form very elongate; caudal fin longer than head. 22. *Anacanthus.*

It has not been practicable in the above Key to show the true relationships of some of the genera, and I give, therefore, the accompanying diagram to illustrate the various evolutionary lines represented by existing genera, according to my interpretation of their characters.

Pervagor, in which dorsal and pelvic spines are better developed than in the succeeding genera, exhibits two features which are not to be found among the other forms possessing a movable pelvic spine—the forward position of the dorsal spine and the presence of a deep groove in which it is received when depressed (the latter character however, being lacking in the subgenus *Acreichthys* noted below). For this reason I consider it should occupy a key position in any attempt at a natural grouping of these fishes. On the one hand it leads to the rest of the genera retaining the pelvic spine but having the dorsal spine behind the eye and without groove, of these, *Stephanolepis* seems to be the group round which the more specialised forms such as *Chætoderma* and *Monacanthus* are clustered.

On the other hand extends the large series of genera in which the pelvic spine has been lost. *Rudarius* is very like *Stephanolepis* except for this feature, and leads through such genera as *Pseudomonacanthus* to the long-bodied forms which culminate in *Alutera* and *Anacanthus*, the latter being a logical development of this line (apart from the mental barbel) and not worthy of more than subfamily rank. *Brachaluteres*, *Paraluteres* and *Pseudalutarius* are advanced offshoots of this series. In another direction we find such genera as *Acanthaluteres* and *Amanses* having a well-developed groove for the reception of the dorsal spine, again with modified offshoots like *Oxymonacanthus* and *Eubalichthys*.

Fig. 2

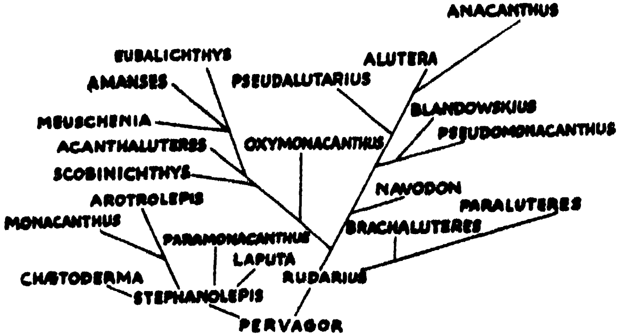


Diagram showing probable relationships of genera in the Aluteridæ.

The end-forms of all these series exhibit reduction of the dorsal spine and pelvic apparatus, the pelvic shield being completely lost in *Alutera*, *Anacanthus*, *Blandowskius*, *Brachaluteres* and *Paraluteres*, and the pelvis very feeble and short in the two latter.

It should perhaps be explained that by " pelvic shield " I refer to a spinate plate of dermal origin which embraces the end of the pelvis just in front of the pelvic spine and often persists when the latter is lost. In *Alutera* it may be present in young examples but lost completely in adults, serving to demonstrate the derivation of the genus from a form possessing this structure.

Subfamily *ALUTERINÆ*.

Genus 1. PERVAGOR Whitley, 1930.

Genotype : *Monacanthus alternans* Ogilby, 1899 (*M. nitens* Hollard, 1854).

Other species : *P. melanocephalus* (Bleeker, 1853) ; *P. janthinosoma* (Bleeker, 1854) ; *P. nigrolineatus* (Herre, 1927) ; *P. spilosoma* (Lay and Bennett, 1839) ; *P. tomentosus* (Linnæus, 1758).

Two subgenera :—

I. Dorsal spine lying in a groove when depressed. Origin of anal behind that of soft dorsal. Lateral line discernible, terminating below soft dorsal. Scales narrow. No dermal filaments. *Pervagor.*

II. Dorsal spine not received in groove when depressed. Origins of dorsal and anal opposite. Lateral line obsolete. Scales broad. Dermal filaments developed .... *Acreichthys*, nov.
(Type *Balistes tomentosus* Linnæus.)

Genus 2. LAPUTA Whitley, 1930.

Genotype : *Monacanthus knerii* Steindachner, 1867.

Other species : *L. cingalensis* Fraser-Brunner (p. 191).

Genus 3. PARAMONACANTHUS Bleeker, 1866.

Genotype : *Monacanthus curtorhynchus* Bleeker. 1866 (= *M. oblongus* Schlegel 1846).

Other species : *P. nemurus* (Bleeker, 1852) ; *P. barnardi* Fraser-Brunner (p. 193) ; *P. otisensis* Whitley, 1931 ; *P. whitleyi* Fraser-Brunner (p. 194) ; *P. horæ* Fraser-Brunner (p. 196) ; *P. nematophorus* (Günther, 1870) ; *P. choirocephalus* (Bleeker, 1852).

Genus 4. STEPHANOLEPSIS Gill, 1861.

Genotype : *Monacanthus setifer* Bennett, 1830.

Other species : *S. freycineti* (Quoy & Gaimard, 1824) ; *S. cirrhifer* (Schlegel, 1750) ; *S. insignis* Fraser-Brunner, 1940 ; *S. diaspros* Fraser-Brunner, 1940 ; *S. ocheticus* Fraser-Brunner, 1940 ; *S. rectifrons* Fraser-Brunner, 1940 ; *S. auratus* (Castelnau, 1861) ; *S. varius* (Ranzani, 1842) ; *S. hispidus* (Linnæus, 1768) ; *S. spilonotus* (Cope, 1870) ; *S. japonicus* (Tilesius, 1810).

Genus 5. CHÆTODERMA Swainson, 1839.

Genotype : *Monacanthus spinosissimus* Quoy & Gaimard, 1824.

Other species : *C. penicilligera* (Cuvier, 1829).

Genus 6. AROTROLEPIS, nov.

Genotype : *Monacanthus sulcatus* Hollard, 1854.

Other species : *A. filicauda* (Günther, 1880) ; *A. notonectianus* (Whitley, 1931) ; *A. barbaræ* Fraser-Brunner (p. 187).

Two subgenera :—

I. Spinules of scales simple. Supraorbital space more than half width of eye. Base of dorsal fin longer than head	*Arotrolepis.*
II. Spinules of scales branched. Supraorbital space more than half width of eye. Base of dorsal fin shorter than head	*Scurrilichthys*, nov.

(Type *Arotrolepis* (*Scurrilichthys*) *barbaræ* Fraser-Brunner).

Genus 7. MONACANTHUS (Cuvier) Oken, 1817.

Genotype : *Balistes chinenis* Osbeck, 1765.

Other species : *M. mylii* Saint-Vincent, 1882 ; *M. macrolepis* Fraser-Brunner (p. 189) ; *M. ciliatus* Mitchill, 1818 ; *M. tuckeri* Bean, 1906.

Two subgenera :—

I. Pelvic spine long (about 6 times its width) ; ventral flap large. Indo-Pacific species......	*Monacanthus.*
II. Pelvic spine shorter (about twice its width) ; ventral flap small or moderate. Atlantic species	*Leprogaster*, nov.

(Type *Monacanthus ciliatus* Mitchill.)

Genus 8. RUDARIUS Jordan & Fowler, 1902.

Genotype : *Rudarius ercodes* Jordan & Fowler, 1902.

Genus 9. NAVODON Whitley, 1930.

Syn.: *Nelus* Whitley, 1930; *Nelusetta* Whitley, 1939.

Genotype: *Balistes australis* Donovan, 1824.

Other species: *N. convexirostris* (Günther, 1870); *N. setosus* (Waite, 1899); *N. galii* (Waite, 1900); *N. analis* (Waite 1904); *N. melas* (Günther, 1870); *N. degeni* (Regan, 1902); *N. ayraud* (Quoy & Gaimard, 1824); *N. modestus* (Günther, 1877); *N. modestoides* (Barnard, 1927); *N. paschalis* (Regan, 1913); *N. melanoproctes* (Boulenger, 1889); *N. tessellatus* (Günther, 1880); *N. multiradiatus* (Günther, 1870); *N. hippocrepis* (Quoy & Gaimard, 1824); *N. skottowei* (Whitley, 1934).

Three subgenera:—

I. Barbs on postero-lateral edges of dorsal spine backwardly directed, the spine not compressed .... *Allomonacanthus*, nov.
(Type *Monacanthus convexirostris* Günther.)

II. Barbs on postero-lateral edges of dorsal spine outwardly directed, the spine often antero-posteriorly compressed.

A. Dorsal and anal fins elevated anteriorly. No caudal spines .... *Nelusetta.*

B. Dorsal and anal fins low. Caudal spines often present .... *Navodon.*

Genus 10. ACANTHALUTERES Bleeker, 1866.

Syn.: *Tobinia* Whitley, 1933.

Genotype: *Monacanthus peroni* Hollard, 1854.

Other species: *A. brownii* (Richardson, 1846); *A. guntheri* (Macleay, 1881); *A. gunnii* (Günther, 1870); *A. spilomelanurus* (Quoy & Gaimard, 1824), etc.

Genus 11. SCOBINICHTHYS Whitley, 1931.

Genotype: *Balistes granulatus* Shaw, 1790.

Genus 12. PSEUDOMONACANTHUS Bleeker, 1866.

Genotype: *Monacanthus macrurus* Bleeker, 1857.

Other species: *P. maynardi* (Ogilby, 1916); *P. tweediei* Fraser-Brunner, 1940; *P. elongatus* Fraser-Brunner, 1940.

Genus 13. MEUSCHENIA Whitley, 1929.

Genotype: *Monacanthus trachylepis* Günther, 1870.

Genus 14. AMANSES Gray, 1833.

Syn. : *Cantherines* Swainson, 1839 ; *Trichoderma* Swainson, 1839 ; *Acanthoderma* Agassiz, 1844 ; *Canthorhinus* Agassiz, 1846 ; ? *Agorein* Gistel, 1848 ; *Liomonacanthus* Bleeker, 1866.

Genotype : *Monacanthus* (*Amanses*) *hystrix* Gray, 1833 (= *Monacanthus scopas* Cuvier, 1829).

Other species : *A. pullus* (Ranzani, 1842) ; *A. fronticinctus* (Günther, 1866) ; *A. sandwichiensis* (Quoy & Gaimard, 1824) ; *A. howensis* (Ogilby, 1889) ; *A. longipinnis* Fraser-Brunner (p. 198).

Two subgenera :—

I. No patch of long spines on side between soft dorsal and anal fins ; caudal peduncle with bristles or small antrorse spines in male .... *Cantherines*.
II. A patch of long spines on side between soft dorsal and anal fins, at least in male.................. *Amanses*.

Genus 15. EUBALICHTHYS Whitley, 1930.

Genotype : *Monacanthus mosaicus* Ramsay & Ogilby, 1886.

Other species : *E. brunneri* (Norman, 1937).

Genus 16. OXYMONACANTHUS Bleeker, 1866.

Genotype : *Balistes longirostris* Bloch & Schneider, 1801.

Genus 17. BLANDOWSKIUS Whitley, 1931.

Genotype : *Blandowskius bucephalus* Whitley, 1931.

Genus 18. BRACHALUTERES Bleeker, 1866.

Genotype : *Aleuterius ? trossulus* Richardson, 1846.

Other species : *B. baueri* (Richardson, 1846).

The distensible stomach in these species has little in common with the specialised " air-sac " of the Tetrodonts.

Genus 19. PARALUTERES Bleeker, 1866.

Genotype : *Alutarius prionurus* Bleeker, 1851.

Genus 20. ALUTERA (Cuvier) Oken, 1817.

Syn. : *Aluteres* Lesson, 1831 ; *Aleuteres* Richardson, 1840 ; *Aleuterius* Richardson, 1846 ; *Alutarius* Cantor, 1850; *Ceratacanthus* Gill, 1861; *Osbeckia* Jordan & Everman, 1898; *Davidia* Ribiero, 1915, etc.

Genotype: *Balistes monoceros* Linnæus, 1758.

Other species: *A. scripta* (Osbeck, 1765); *A. lævis* (Bloch, 1795); *A. schoepfi* (Walbaum, 1792).

Three subgenera:—

I. Dorsal rays less than 40. Anal rays 40. Pectoral rays 12	*Ceratacanthus.*
II. Dorsal and anal rays more than 40. Pectoral rays 14.	
A. Caudal peduncle longer than deep. Snout straight or convex	*Alutera.*
B. Caudal peduncle deeper than long. Snout concave	*Osbeckia.*

Genus 21. PSEUDALUTARIUS Bleeker, 1865.

Syn.: *Pseudaluteres* Bleeker, 1866.

Genotype: *Aluteres nasicornis* Schlegel, 1846.

Subfamily *ANACANTHINÆ*.

Genus 22. ANACANTHUS Gray, 1831.

Syn.: *Psilocephalus* Swainson, 1839; *Pogonognathus* Bleeker, 1849.

Genotype: *Anacanthus barbatus* Gray, 1831.

DESCRIPTIONS OF NEW SPECIES.

Arotrolepis (*Scurrilichthys*) *barbaræ*, sp. n.

Profile of snout straight, scarcely forming an angle with that of interdorsal space. Depth of body contained 2¼ times in length of fish; length of head 3 times. Diameter of eye contained 2½ times in length of snout, 3 times in that of head. Distance from base of dorsal spine to nearest point on orbit less than half diameter of eye. Distance between orbit and upper end of gill-opening about half width of the gill-opening, which is ⅔ width of eye. Base of anal fin about equal to that of soft dorsal, slightly shorter than length of head. Caudal peduncle deeper than long, its width at base of caudal fin equal to diameter of eye.

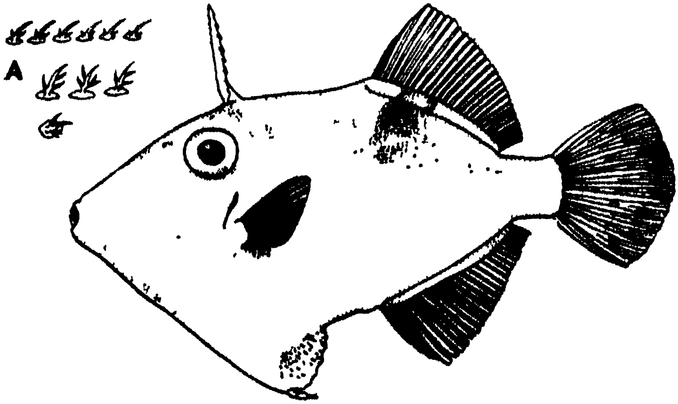
Dorsal spine stout, about ⅔ length of head, with a double row of minute barbs on anterior face near its distal end, and a row of 6 or 7 strong downwardly directed barbs on each postero-lateral edge. Interdorsal space much shorter than head. Soft dorsal fin elevated anteriorly, with 29–31 rays, the 3rd the longest. Anal fin similar, with 29–31 rays. Pectoral rays 12. Movable pelvic spine present, tapering, with small spines at tip. Ventral flap small. Scales in distinct longitudinal series, each with a central spine which branches distally, the branches backwardly directed and overlapping the scale behind. Lateral line not evident.

Pale brownish, a dark oblique band on back below anterior third of soft dorsal fin.

Hab. Australia (Queensland ?).

Described from two examples, 67 and 71 mm. in standard length, from Australia (*McGillivray*), and one, 65 mm. long, from Queensland (?) (*Saville Kent*), in the British Museum (Nat. Hist.). The largest is selected as the holotype.

Fig. 3.



Arotrolepis (*Scurrilichthys*) *barbaræ*. Holotype (× 1¼).
A, scales.

It is possible that all the Australian records of *A. sulcatus* (Hollard), which it much resembles, belong to this species, though *A. notonectianus* (Whitley) may also have been similarly confused, as Whitley has suggested. The present form is easily distinguishable by the characters given above for the subgenus.

I name this fish after my wife Barbara, in grateful recognition of her invaluable assistance and devoted interest in my work at all times.

Monacanthus macrolepis, sp. n.

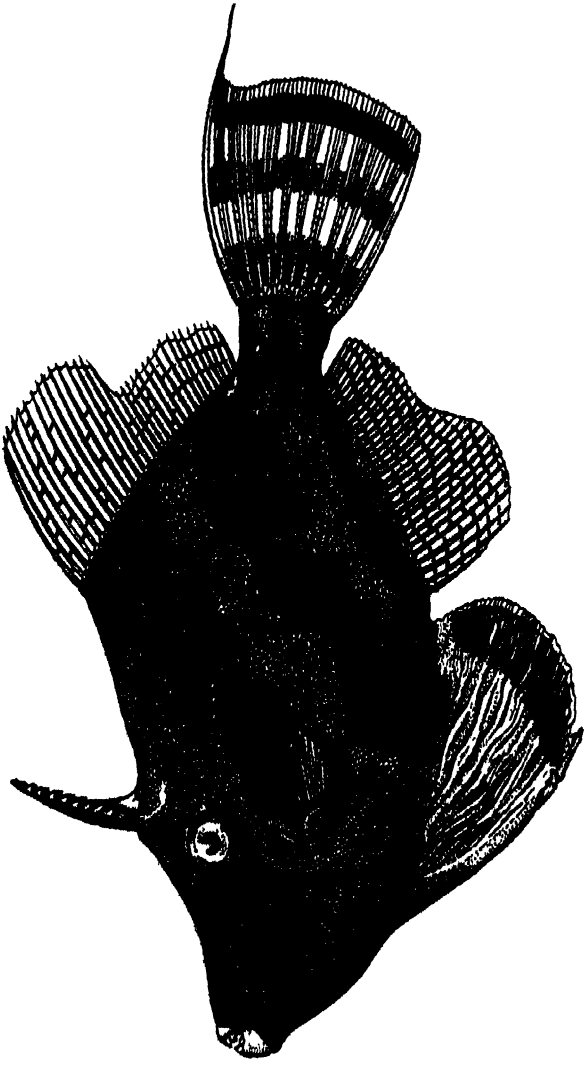
Monacanthus megalurus Günther, 1870, Cat. Fish. Brist. Mus. viii. p. 237 (non Richardson, 1843).

Study of the Old-world forms of *Monacanthus* shows them to fall into 3 species, one of which, *M. chinensis*, is widely distributed through the East Indies and in Chinese waters. The second is a more slender form with a longer caudal fin, which apparently occurs on the coasts of both Western Australia and Queensland; it was this species which was described and quite well figured as *M. megalourus* by Richardson, from Houtman's Abrolhos, Sharks Bay, Western Australia, but the earlier name *M. mylii* Saint-Vincent should apparently be applied to it.

A third very distinct species, incorrectly identified with *M. megalourus* by Günther and subsequent authors, occurs on the coast of New South Wales, and since none of the names in the literature can be associated with it I describe it here as new:—

Profile of snout concave, making slight angle with that of interdorsal space, which is also slightly concave. Dorsum high. Depth of body contained $1\frac{5}{8}$ to $1\frac{7}{8}$ times in length of fish; length of head $3\frac{2}{3}$ times. Diameter of eye contained $3\frac{3}{4}$ times in length of head, $2\frac{1}{2}$ times in that of snout. Distance from base of dorsal spine to nearest point on orbit equal to diameter of eye. Distance between orbit and upper end of gill-opening less than diameter of eye, about equal to width of gill-opening. Dorsal spine stout, about $\frac{2}{3}$ length of head, without barbs anteriorly, a row of about 10 strong downwardly-directed barbs on each postero-lateral edge. Interdorsal space equal to length of head. Soft dorsal fin much elevated anteriorly, with 32–34 rays (rarely 31), its base much longer than head. Anal fin less elevated, with 32–34 rays, its base a little shorter than that of soft dorsal. Pectoral rays 13. Movable pelvic spine long and tapering; ventral flap greatly developed, expanded far beyond pelvic spine in adults. Scales relatively large (about 20 in transverse series between ends of dorsal and anal fins), each with a large, keel-like central spinule (which supports and protects a tactile papilla) and a smaller one above and below it (the latter scarcely developed in small specimens); 2 rows of 3 enlarged, buckler-like scales on caudal peduncle, bearing large backwardly-directed spines.

Fig. 4.



Monacanthus macrolepis. Holotype ($\times \frac{3}{7}$).

Lateral line present. Caudal peduncle deeper than long, its width at base of caudal fin about half length of head, its length equal to diameter of eye. Caudal fin shorter than head. Brown; upper part of snout dark; two dark bands between eyes and two obliquely from eye across cheek; a broad irregular band from front of soft dorsal to ventral flap; two dark patches at base of anal; caudal fin with three dark transverse bands. Dorsal and anal fins with dark spots forming several horizontal wavy lines.

Hab. Coast of New South Wales.

Described from a number of specimens in the British Museum (Nat. Hist.); the holotype is 215 mm. long.

This species is well distinguished from *M. chinensis* and *M. mylii* by the large and characteristic scales, by certain proportions (shorter gill-opening and caudal peduncle, etc.) and fewer barbs on the dorsal spine.

Laputa cingalensis, sp. n.

Profile slightly convex, making a distinct angle with that of inter-dorsal space, which is straight. Depth of body contained 2½ times in length of fish, length of head 3 times. Interorbital width equal to diameter of eye. Diameter of eye contained 2½ times in length of snout, 3¼ times in that of head. Distance from base of dorsal spine to nearest point on orbit half diameter of eye. Gill-opening about equal to its distance from orbit, half diameter of eye. Dorsal spine slender, about ⅔ length of head, with two rows of about 12 strong downwardly directed barbs on its anterior face and a row of similar but slightly smaller ones on each postero-lateral edge. Interdorsal space equal to length of snout. Soft dorsal fin slightly elevated anteriorly, with 28 rays, the 5th the longest; the base of the fin nearly as long as the head. Anal fin similar, with 28 rays, its base as long as the snout. Pectoral rays 12. Movable pelvic spine small, spinate at tip; ventral flap small. Scales very small, each with a number of minute spinules arising directly from basal plate. Lateral line not evident. Depth of caudal peduncle at base of caudal fin equal to its length, which is contained 3¼ times in length of head. Caudal fin ⅔ length of head.

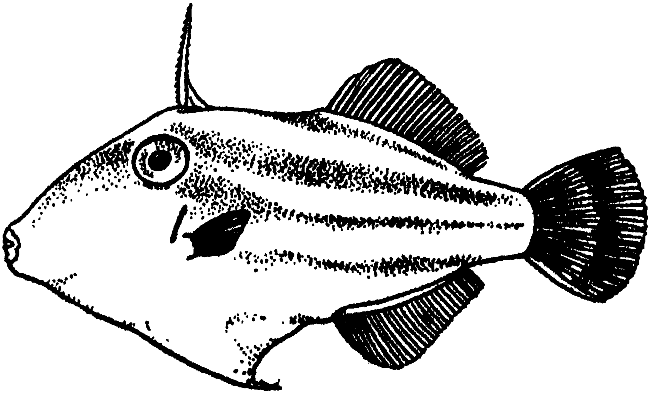
Greyish; upper part of snout dark; 4 longitudinal bands, the upper one from middle of interdorsal space to end of soft dorsal fin, the second from above eye to uppermost caudal rays, the third from below eye to middle caudal rays, the fourth from base of pectoral to lowermost caudal rays ; caudal fin with 2 transverse dark bands.

Hab. Ceylon.

Described from a single specimen, 68 mm. long, in the British Museum (Nat. Hist.), holotype of the species.

I have not seen *Monacanthus* (*Paramonacanthus*) *knerii* Steindachner, which appears to be known only from the original description, but it seems to have been like *Paramonacanthus* except for the presence of barbs on the anterior face of the dorsal spine. The specimen described here has similar well-developed anterior barbs (which are not to be found in any of the numerous examples of *Paramonacanthus* species that I have examined), and I therefore place it provisionally in the genus *Laputa* proposed by Whitley for *M. knerii*. In the latter species, however (from China), the snout is slightly concave, the body deeper, the posterior dorsal barbs larger than the anterior, the soft dorsal and anal rays more numerous (D 35, A 34), and on each side of the tail there are " 2 rows of thin hook-like spines pointing backwards," unlike any other Aluterid known to me. Both species have longitudinal bands on the upper part of the body, and 2 bands across the caudal fin.

Fig. 5.



Laputa cingalensis. Holotype (nat. size).

Paramonacanthus barnardi, sp. n.

Monacanthus oblongus Günther, 1870, Cat. Fish. Brit. Mus. viii. p. 241 (part.); Barnard, 1927, Ann. S. Afric. Mus. xxi. pt. 2, p. 956 (part.).

Male :—Dorsal profile of snout convex, in continuous curve with that of interdorsal space. Dorsal fin-base scarcely elevated. Depth of body contained 2⅔ times in length of fish. Length of interdorsal space less than that of snout.

Female :—Dorsal profile of snout straight or concave, making a slight angle with that of interdorsal space. Dorsal fin-base rather abruptly elevated. Depth of body contained 2⅛ to 2¼ times in length of fish. Length of interdorsal space equal to that of snout.

Length of head contained 2¾ to 3⅛ times in that of fish. Diameter of eye contained 3½ to 4½ times in length of head, 3 to 3½ times in that of snout. Distance from base of dorsal spine to nearest point on orbit half diameter of eye. Gill-opening ⅔ width of eye, the distance of its upper end from the orbit equal to diameter of eye. Dorsal spine slender but strong, measuring 1⅔ to 1¾ times in length of snout, its anterior face without barbs, but a row of about 6 strong downwardly-directed barbs distally on each postero-lateral edge. Soft dorsal fin elevated anteriorly, with 25–27 rays, the 4th the longest, the base of the fin about as long as the head. Anal fin slightly posterior to soft dorsal, similar, with 25–27 rays. Pectoral rays 11. Movable pelvic spine small, tapering, spinate at tip; ventral flap very small and narrow. Scales very small, each with a number of small spinules arising directly from basal plate. Lateral line distinct. Depth of caudal peduncle greater than its length, which equals diameter of eye. Middle rays of caudal fin produced in adults, sometimes as long as the head.

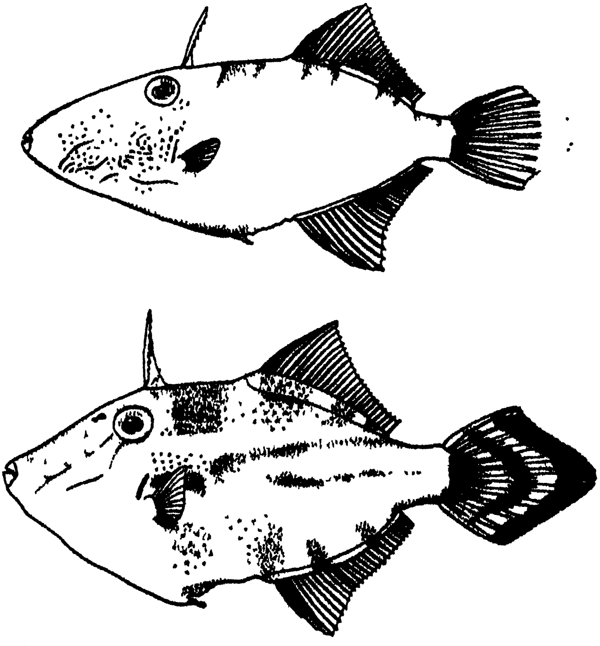
Brownish, with numerous small dark punctilculations forming narrow lines across cheek; 4 broad transverse bands, most prominent on back, the first from interdorsal space to pelvic spine, second between anterior ends of soft dorsal and anal fins, third between hind ends of same fins, fourth across caudal peduncle; caudal fin with dark transverse median and marginal bands.

Hab. Zanzibar; Mombasa.

Described from a male example 85 mm. long from Zanzibar, and a female 90 mm. long from Mombasa, both in the British Museum (Nat. Hist.). The male is chosen as the holotype to compare with that of *P. oblongus*, also in our collection. In addition, we have nine examples, of both sexes, from Playfair's Zanzibar collection, in rather bad condition.

Closely related to *P. oblongus* (Schlegel), from which it differs in having a longer snout, larger eye, the gill-opening nearer the eye, a shorter caudal peduncle, dorsal spine with fewer and stronger barbs, in pattern and other minor points. Named after Dr. A. K. Barnard of the South African Museum.

Fig. 6.

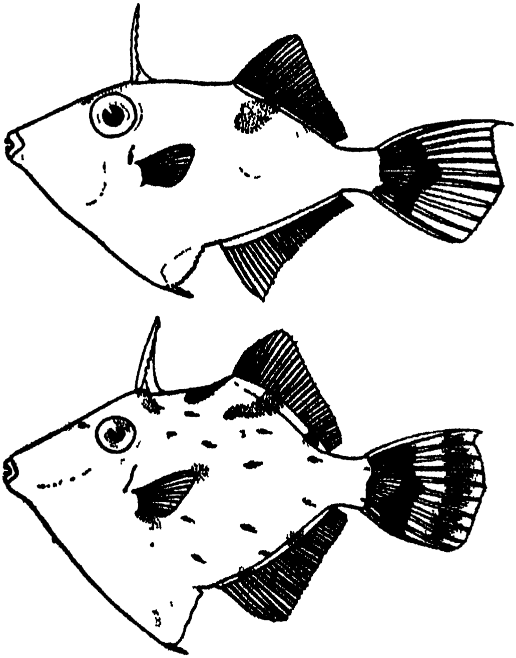


Paramonacanthus barnardi. Above : male (holotype). Below : female. (× [illegible].)

Paramonacanthus whitleyi, sp. n.

Dorsal profile of snout straight, that of interdorsal space concave ; dorsum rather high. Depth of body contained 1⅔ times in length of fish, length of head 2¾ times. Diameter of eye contained 2¼ times in length of snout, 3¼ times in that of head. Distance from base of dorsal spine to nearest point on orbit ⅔ diameter of eye. Distance from eye to upper end of gill-opening ½ width of gill-opening, which is ⅔ diameter of eye. Dorsal spine stout, equal to interdorsal space, ⅔ length of head, without barbs anteriorly but with about 6 strong ones on each

Fig. 7.



Paramonacanthus whitleyi. Holotype (nat. size) (below), compared with *P. otisensis* Whitley, of same size (above).

posterior edge. Soft dorsal fin elevated anteriorly, with 28 rays, its base as long as head. Anal fin similar, with 30 rays, its base longer than that of soft dorsal. Pectoral rays 12. Movable pelvic spine small, tapering, spinate; ventral flap small. Scales as in preceding species. Lateral line evident. Branched, fleshy dermal filaments scattered on side. Caudal peduncle half as long as deep, its length ¾ diameter of eye. Caudal fin about as long as head.

Yellowish brown ; a dark patch at base of dorsal spine, another in middle of interdorsal space, a third below anterior half of soft dorsal ; a broken irregular band from end of soft dorsal to pectoral fin ; caudal fin with a broad marginal dark band and one across its basal third.

Hab. Western Australia.

Described from the type, a specimen 50 mm. long, from between Cape Jaubert and Wallah, Western Australia, received on loan from the Australian Museum through the good offices of Mr. Gilbert P. Whitley, after whom the species is named. In addition I have examined one, 32 mm. long, from Gantheaume Point, Broome, and one, 37 mm. long, from between Broome and Cape Bossutt, Western Australia, both of the Australian Museum collection.

Nearly related to *P. otisensis* Whitley, from New South Wales, but differing in the deeper body, high supra-dorsal width and wide gill-opening, as shown in the accompanying figure comparing specimens of the same size.

Ordinarily, I should hesitate to describe such small specimens as new, but here the differences are so apparent that I feel justified in doing so, especially in view of the distinct locality. In other species of *Paramonacanthus* dermal filaments are well-developed in young females, and the presence of these appendages in the present type may therefore be taken as an indication of its sex.

Paramonacanthus horæ, sp. n.

Dorsal profile of snout straight, making a very slight angle with that of interdorsal space. Depth of body contained 2–2⅓ times in length of fish, length of head 3 times. Diameter of eye contained 2¾ times in length of head, twice in that of snout. Distance from base of dorsal spine to nearest point on orbit ⅓ diameter of eye, and equal to distance between eye and upper end of gill-opening ; gill-opening about ⅓ width of eye. Dorsal spine stout, equal to length of snout and to interdorsal space, without barbs anteriorly but with about 12 barbs on each postero-lateral edge ; the barbs often bifid and difficult to count. Soft dorsal fin scarcely elevated anteriorly, with 28 rays, its base equal to length of head.

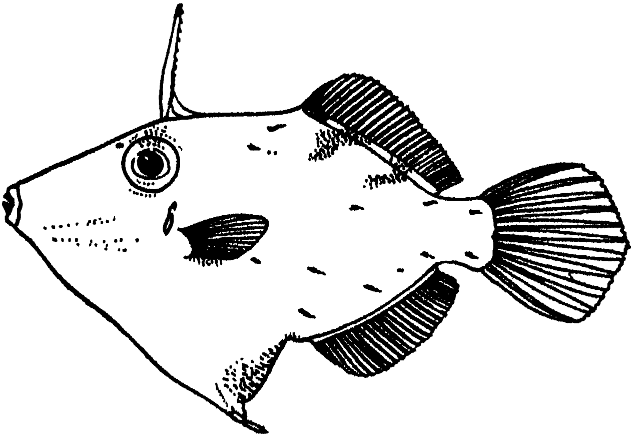
Anal fin similar, with 28 rays, its base shorter than that of soft dorsal. Pectoral rays 12. Movable pelvic spine small, tapering, spinate at the edges. Ventral flap small. Scales as in rest of genus. Lateral line indistinct. Simple dermal filaments scattered on side. Caudal peduncle $\frac{2}{3}$ length of eye, much deeper than long. Caudal fin shorter than eye.

Brownish; two dark blotches, probably remains of oblique transverse bands, at base of soft dorsal fin.

Hab. Indian Ocean.

Described from the holotype, 67 mm. long, from E. coast, Madras Presidency, and a paratype from the same locality, in the British Museum (Nat. Hist.); a specimen 20 mm. long from the Maldives, in the same collection; and two (N. Andaman Sea and Madras) received on loan from the Indian Museum.

Fig. 8.



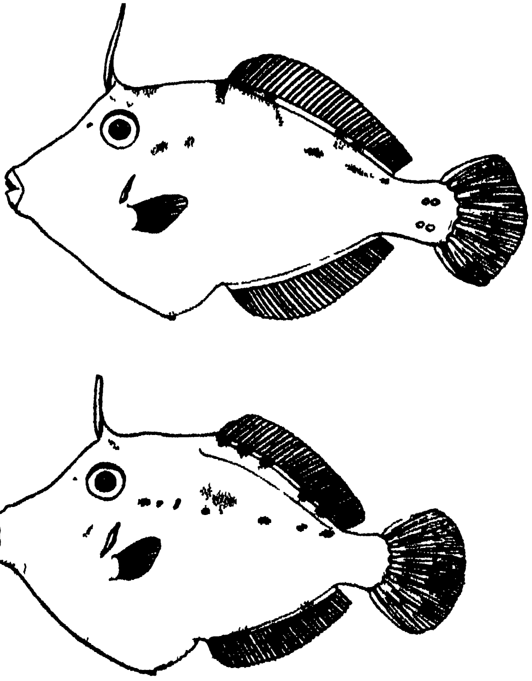
Paramonacanthus horæ. Holotype (× nat. size).

This species is close to *P. choirocephalus* Bleeker, the type of which is in the British Museum, differing in possessing 12 pectoral rays instead of 14, in the very narrow supra-orbital width, the larger eye, and other features. I have pleasure in naming it after Dr. Sunda Lal Hora, to whom I am indebted for the loan of a large series of Indian Plectognath fishes.

Amanses (*Cantherines*) *longipinnis*, sp. n.

Dorsal profile of snout concave, making an angle with that of interdorsal space. Depth of body contained 2 to 2¼ times in length of fish, length of head 3¼ to 3½ times. Diameter of eye contained 2½ times in length of snout, 3½ times in that of head. Distance from base of dorsal spine to nearest point on orbit ⅔ diameter of eye, equal to distance between eye and upper end of gill-opening. Gill-opening equal to diameter of eye, entirely below hind margin of orbit. Dorsal spine originating above anterior margin of eye, with a row of very small barbs on each postero-lateral edge. Interdorsal space as long as, or

Fig. 9.



Amansea (*Cantherines*) *longipinnis* Above: male (holotype). Below: female. (× ½).

slightly longer than snout. Soft dorsal fin low, with 34–35 rays, its base contained 2½–2⅓ times in length of fish, about 1½ times length of interdorsal space. Anal fin similar, with 32 rays, its base shorter than that of soft dorsal. Pectoral rays 11. No pelvic spine; pelvic shield small, spinate; ventral flap small. Scales very small, each with 2 or 3 upright spinules; two pairs of bucklers, bearing antrorse spines on side of caudal peduncle, in male. Lateral line not evident. Caudal peduncle 1½ times diameter of eye (male) or equal to it (female). Caudal fin half length of head.

Brown, sometimes very dark; 3 broad transverse bands on back, the first immediately behind dorsal spine, the second below front part of soft dorsal, the third below hind part of same fin; a row of dark spots between eye and end of soft dorsal fin.

Hab. Lord Howe Island.

Described from a male specimen, 175 mm. long, holotype of the species, and a female 155 mm. in length; also two others (150–160 mm.); all received on loan from the Australian Museum.

Distinguished at once from other members of the genus by the very long bases of the dorsal and anal fins. It is quite different from *C. howensis*, first recorded from Lord Howe Island, but since found to occur at other places in Oceania.

XVII.—*Descriptions of new Ants* (*Hym.*, Formicidæ) *from various Localities.* By HORACE DONISTHORPE, F.Z.S., F.R.E.S., &c., Department of Entomology, British Museum (Natural History).

Subfamily *CERAPACHYINÆ.*

Tribe CERAPACHYINI.

Cerapachys antennatus Smith ?

♂. Shining black, mandibles, apex of gaster, postpetiole beneath at base, trochanters, knees, tarsi, and antennæ more or less, reddish. Clothed with longer and shorter outstanding yellow hairs.

Head triangular, narrowed in front, posterior angles rounded, posterior border margined, widely but not deeply excised, covered with a network of raised ridges; mandibles well developed, marked with a few larger and smaller shallow punctures; *masticatory border* unarmed; *clypeus* moderately convex, anterior border margined, rounded; *frontal carinæ* short, convergent behind, sharp, soldered to clypeus, not covering insertion of antennæ, enclosing a small, round, rather deep pit; *eyes* large, prominent, round-oval; *ocelli* large, situated on top of head; *antennæ* 13-jointed, pubescent, *scape* as long as the first three joints of the funiculus taken together, *funiculus* with first two joints short and of about equal length, the rest of the joints broader and longer, increasing in length and breadth to apex, last joint long, pointed, about equal in length to the two preceding taken together. *Thorax* longer than broad, slightly narrowed in front, more so behind, broadest just before insertion of wings; *pronotum* transverse, truncate and margined anteriorly, posterior border widely and deeply excised, embracing the mesonotum, smooth and raised in centre at base, sides straight, furnished with raised longitudinal ridges; *mesonotum* moderately convex, smooth and shining, with a few shallow scattered punctures; *mayrian furrows* very distinct, wide, deep, punctured; *præscutellum* transverse, hollowed out on each side, forming raised rounded rims at sides, in the middle there is a transverse depression, deeper at each side, the centre portion furnished with three longitudinal raised ridges; *scutellum* not very convex, more or less smooth and shining, with a few scattered shallow punctures; *metanotum* narrow, transverse; *epinotum* transverse, smooth and shining in centre, sides with raised ridges, forming a network of large round punctures, *declivity* abrupt, round, flat, with a sharp raised rim round edges, finely transversely striate; a row of large, round oval, fairly deep punctures extends between the *episternite* and the *epimeron* of the mesonotum. *Petiole* longer than broad, narrowed behind middle, furnished with longitudinal raised ridges, apex very finely transversely striate, beneath a narrow wedge-shaped ridge extends, bluntly toothed anteriorly, the tooth pointing downwards; *post-petiole* (=first segment of gaster) smooth and shining, longer than petiole, longer than broad, narrowed in front and behind, broadest behind middle, furnished beneath anteriorly with a narrow tooth projecting forwards, constriction between post-petiole and second segment of gaster very marked ; *gaster* smooth and shining, second segment longer and broader than post-petiole, sides narrowed in front and behind middle. No *cerci* present ; *genitalia* concealed ; *subgenital lamina* strongly forked. *Wings* slightly dusky, iridescent, *pterostigma* and *veins* brown, fore wing with one *discoidal cell*, one large closed *cubital cell*, and *radial cell* short, closed.

Long. 7 mm.

Type in B.M.

Described from a male taken by G. E. Bryant in Borneo, Mt. Matang, W. Sarawak, December 16th, 1913.

In my opinion the above-described ant is the male of Smith's *Cerapachys antennatus* ☿ [Journ. Proc. Linn. Soc. Lond. Zool. ii. p. 74 (1857)].

Type locality : Sarawak, Borneo.

Smith suggested that his *C. oculatus* ♂ (*l. c.*) might be the male of *antennatus*. The size, however, is too small, and the colour wrong, etc.

Wheeler re-described *antennatus* ☿ [Bull. Mus. Compar. Zool. lxiii. p. 45 (1919)] from Kuching, Borneo, which is near to Matang Mountain, Bryant's locality.

Wheeler further described a new *Cerapachys*—*C. bryanti* (*l. c.* p. 47)—a small castaneous species taken by G. E. Bryant, also on Matang Mt., and sent to him by myself.

In the 'Genera Insectorum,' cxviii. p. 8 (1911), Emery gives a short diagnosis of the male of *Cerapachys* which he says he has taken from Forel's description of *C. aitkeni* [Journ. Bombay Nat. Hist. Soc. xiii. p. 332 (1900)]. This agrees quite well with our male, with the exception that no mayrian furrows are said to be present. In a large ant from Muong You in the British Museum, which was named by Wheeler "*Cerapachys* sp. ♂," the mayrian furrows are very distinct. The general structure of this large male is similar to that of our species, with the exception that the radial cell is long and open.

It would thus appear that the males of species of *Cerapachys* vary in these two points.

Subfamily *Ponerinæ*.

Tribe Platythyreini.

Platythyrea ceylonensis, sp. n.

☿. Black, mandibles, legs and antennæ reddish brown, articulations of legs, apex of scape and funiculus lighter, last two segments of gaster, and apex of other segments narrowly, reddish yellow, with the usual pruinose surface, which is grey in colour, and small scattered punctures.

Head oblong, broadest just behind eyes, posterior angles rounded, posterior border excised in middle; *mandibles* triangular, slightly curved downwards, apical tooth blunt, masticatory border with a number of indistinct small blunt teeth; *antennæ* moderate, *scapes* not extending beyond posterior angles of head, joints of *funiculus* gradually increasing in breadth to apex, last joint pointed; *clypeus* convex, anterior border rounded, posterior border rather indistinctly defined; *frontal area* ill-defined; *frontal furrow* faint, almost extending to base of head, with two small shallow pits, one situated before middle, the other near base; *frontal carinæ* sinuate behind the not very prominent lobes; *eyes* large, oval, rather flat, situated at sies of head a little before middle. *Thorax* long, narrowed to base; *pronotum* ample, convex, anterior angles rounded, posterior border rounded; *pro-mesonotal suture* very distinct; no *suture* present between mesonotum and epinotum, which are together longer than pronotum; *dorsal surface* of *epinotum* excised at base, with posterior angles armed with a short pointed tooth, *declivity* abrupt, slightly concave, faintly transversely striate; *node* of *petiole* longer than broad, convex, sides rounded and narrowed to base; *gaster* long, narrowed to apex, second segment considerably longer than first (*i. e.*, *post-petiole*); *pygidium* furnished with a small bunch of longer and shorter fine yellow hairs; *sting* excerted.

Long. 6·5 mm.

♀. Similar in colour and appearance to the ☿. The sculpture is a little stronger, the teeth to the epinotum shorter and blunter, and the sting longer. The *ocelli* are very small and inconspicuous. The *suture* between the pronotum and mesonotum is very distinct, the *sutures* between the *mesonotum* and *præscutellum*, and *scutellum* and *metanotum* are fine but distinct, *suture* between *metanotum* and *epinotum* stronger ; the *scutellum* is not very clearly defined.

Long. 7 mm.

Type and ♀ type in B.M.

Described from a worker and a deälated female taken by Dr. Thwaites in Ceylon. Registered number 67. 25. This insect comes near to a little group of small species of *Platythyrea*—*sagei* Forel (India), *pusilla* Emery (Amboina), *subtilis* Emery (Borneo), *wroughtoni* Forel (India), etc.

It is larger, however, than any of them, and differs in structure, etc.

The only other species of this genus known to occur in Ceylon is *P. thwaitesi* Donisthorpe [Ann. & Mag. Nat. Hist. (s. 10) viii. p. 496 (1931)] ; also taken by Dr. Thwaites.

Subfamily *MYRMICINÆ.*

Tribe CREMATOGASTERINI.

Crematogaster (*Rhachiocrema*) *aculeata*, sp. n.

☿. Head, thorax and antennæ slightly reddish yellow, legs, petiole and post-petiole pale yellow, gaster jet black, with a slight violet reflexion, teeth of mandibles red, eyes black, smooth and shining, clothed with a few scattered outstanding yellow hairs.

Head subquadrate, posterior angles rounded, posterior border sinuate ; *mandibles* slightly longitudinally striate, triangular, masticatory border armed with four moderately sharp teeth ; *clypeus* convex, anterior border straight, posterior border rounded, with a rather distinct longitudinal carina on each side and a few faint lines in centre ; *eyes* round, convex, not very large, with rather coarse facettes ; *antennæ* 11-jointed, with a distinct two-jointed club ; first joint of *funiculus* about as long as (and somewhat wider than) the next two taken together, last joint of *club* about twice as long as the one preceding it. *Thorax* considerably contracted in middle ; *pro-mesonotum* rather flattened, with no suture between ; *mesonotum* with a distinct longitudinal ridge on each side at base ; *suture* between mesonotum and epinotum deep ; *epinotum* with dorsal surface slightly concave and wide, armed with two long thin sharp divergent spines, which are almost straight. *Petiole* narrowed in front, broadest just before base, *node* with posterior corners slightly raised; *post-petiole* a little shorter than petiole, narrowed anteriorly and rounded posteriorly; *gaster* short oval, with apex considerably curved upwards.

Long. 2·7 mm.

Type in B.M.

Described from a single worker taken by Miss L. E. Cheesman in Dutch New Guinea, Cyclops Mountains, Sabron, 2000 ft., July, 1936.

This distinct species differs from *paradoxa* Emery, and *wheeleri* Mann, in colour, the shape and structure of the spines, etc. It is decidedly smaller than the former, and slightly larger than the latter. *C.* (*R.*) *paradoxa* has a black head, and *C.* (*R.*) *wheeleri* is all black except the mandibles, funiculi, and tarsi, which are yellow. The petiole in *paradoxa* is considerably longer than in either *wheeleri or aculeata*.

I am not very happy about the subgenus *Rhachiocrema*. Mann [Bull. Mus. Comp. Zool. lxiii. p. 318 (1919)] created it for the reception of *Crematogaster* (*Orthocrema*) *paradoxa* Emery from New Guinea, and his new species *C.* (*R.*) *wheeleri* from the Solomons, which he made the type. His diagnosis consists of—" the enormous development of the epinotal spines and the elongate pedunculate structure of the petiole and the elongate 12-jointed antennæ with the 2-jointed funicular club." *C. paradoxa* has an 11-jointed antenna, and although Mann describes and figures *wheeleri* with a 12-jointed antenna, I am not aware of any other species of *Crematogaster* in the world with this number. The length of the antennæ and the petiole are longer in *paradoxa* than in the other two species, and it would seem that the only reliable character is the long epinotal spines.

Tribe SOLENOPSIDINI.

Liomyrmex froggatti Donis., subsp. *major*, subsp. nov.

♀. This insect is closely allied to the typical form from New Guinea, and is probably a local race of the same. It is larger (10·7 mm. as against 9·2 mm.), the petiole is distinctly less transverse and the pubescence and outstanding hairs are sparser. Otherwise it agrees quite well with *froggatti* in colour, structure, etc.

Long. 10·7 mm.

Type in B.M.

Described from a deälated female taken by Dr. Stephenson in the Philippine Islands, Registered number 47.22.

We described *L. froggatti* in 1940 [Ann. & Mag. Nat. Hist. (s. 11) v. pp. 40-45, 3 text-figs. (1940)] and gave a list of the known species and their localities. The other known species from the Philippines, *L. tagalanus* Menozzi, is quite different in colour, structure, etc.

Subfamily *DOLICHODERINÆ.*

Tribe TAPINOMINI.

Technomyrmex gilvus, sp. n.

☿. Pale yellow, teeth to mandibles red, eyes black, very finely punctured and clothed with very fine yellow pubescence.

Head oblong, narrowed in front and behind, broadest behind middle, posterior angles rounded, posterior border sinuate; *mandibles* long, triangular, masticatory border armed with a number of small sharp teeth, the apical one, the one before and the third from it being the longest; *clypeus* moderately convex, posterior border rounded, anterior border excised, with a rather sharp tooth at each side of excision; *frontal area* and *furrow* absent; *frontal carinæ* short, widely separated; *eyes* large, oblong oval, with rather coarse facets; *antennæ* long, 12-jointed, *scape* long, extending beyond posterior border of head by about one-sixth of its length, *funiculus* gradually increasing in thickness to apex, all the joints longer than broad, first joint longer than second, last joint as long as the two preceding taken together; *maxillary palpi* long, 6-jointed; *labial palpi* 4-jointed. *Thorax* and *petiole* typical in size and shape; *gaster* long oval; *cloacial opening* apical. *Legs* long.

Long. 3 mm.

Described from 14 specimens taken by Miss L. E. Cheesman on herbage, Papua, Kokoda, 1200 ft., iv.1933.

Type in B.M.

As far as I am aware this is the only entirely yellow species of *Technomyrmex*.

Subfamily *Formicinæ*.

Tribe Melophorini.

Notoncus rodwayi, sp. n.

♀. Dark brown, legs lighter, cheeks, apex of scapes and base of joints of funiculi reddish; mandibles reddish yellow, teeth black. Clothed with longer and shorter widely scattered yellowish outstanding hairs, pubescence yellow, very sparse.

Head subquadrate, slightly narrowed in front, posterior angles rounded, posterior border widely and very slightly excised; *mandibles* triangular, long, crossed at tips, with larger and smaller shallow punctures, chiefly near masticatory border which is armed with 5 teeth, the apical one very long and pointed, the 4th longer than those preceding it, the 2nd longer than 1st and 3rd; *clypeus* large, triangular, convex, finely longitudinally striate, with a sharp longitudinal carina in centre, anterior border emarginate in centre; *frontal area* distinctly defined, finely longitudinally striate; *frontal fovæ* rather deep; *cheeks* finely obliquely striate; rest of head finely longitudinally striate; *frontal carinæ* moderately raised, divergent, slightly sinuate at base; *eyes* large, round oval, moderately convex, placed behind centre of sides of head; *ocelli* small, situated near posterior border of head; *antennæ* moderate, *scape* extending beyond posterior border of head by about its width at broadest part, *funiculus* thickened to apex, 1st joint about as long as the two following taken together, last joint narrowly pointed, about as long as the two preceding taken together. *Thorax* longer than broad, slightly narrowed to base; *pronotum* transverse, the anterior portion concave, produced into a neck, finely transversely striate, anterior angles projecting and bluntly pointed; *mesonotum* subquadrate, convex, finely but distinctly longitudinally striate; *præscutellum* very narrow; *scutellum* prominent, longitudinally striate; *metanotum* narrow, transverse, finely transversely striate; *epinotum* transversely striate, *dorsal surface* convex, considerably shorter than the declivity, furnished on each side at base with a small blunt tubercle, *declivity* fairly abrupt, flat. *Scale of petiole* rather high, narrow, excised at apex, forming a short sharp tooth on each side, sides excised beneath these teeth and with a short blunt tubercle on each side at base of excision, anterior surface concave, posterior surface convex ; *gaster* smooth and shining, long oval, broadest near base of 1st segment.

Long. 8 mm.

Type in B.M.

Described from a deälated female taken by F. A. Rodway, New South Wales, Nowra, September, 1924.

This distinct species does not agree with the descriptions of any of the known species.

In the 'Genera Insectorum' (1925) the wings are said to be unknown. In two winged females of *N. gilberti* Forel, in the British Museum, the *veins* and *pterostigma* are light yellowish brown ; one *discoidal cell* and one *cubital cell* are present and the *radial cell* is closed. This also agrees with Viehmeyer's description of the wing of *N. politus* [Ent. Mitt. xiv. p. 39 (1925)].

Tribe CAMPONOTINI.

Camponotus (*Myrmophyma*) *flavocrines*, sp. n.

☿. Black, mandibles (except at the base, and all the teeth of the masticatory border except the apical one) and dorsal surface of gaster (except the two apical segments) yellow. Clothed with long pale yellow outstanding hairs, pointing forwards on head and thorax, and backwards on petiole and gaster ; and with very fine short decumbent yellow hairs, which are longer and closer on head and thorax. A tuft of long yellow decumbent hairs is present on the pronotum. The whole body is finely reticulate.

Head longer than broad, viewed in profile it is bent downwards at right-angles at the insertion of the antennæ, viewed in front the cheeks appear to be almost straight, the top of the head is flat, and the eyes are placed on each side where the angle commences ; sides of head behind eyes rounded to posterior angles, the latter rounded and the posterior border sinuate ; *mandibles* large, triangular curved, punctured, armed with six strong pointed teeth, the apical one very long and curved ; *clypeus* large, triangular, anterior border sinuate on each side, longitudinally raised in middle, giving the appearance of a carina, bluntly pointed at apex ; *frontal area* not distinctly defined ; *frontal carinæ* with sharp raised edges, convergent in front, divergent and sinuate behind; *antennæ* long, *scapes*, when bent back, extending beyond pro-mesonotal suture. *Thorax* viewed from the side forming a regular arch, narrowed to base; *pronotum* rounded and margined anteriorly; *pro-mesonotal suture* very distinct; no *suture* between mesonotum and epinotum; *epinotum* without an angle between dorsal surface and declivity. *Petiole* furnished with a small node rounded above and bluntly pointed beneath; *gaster* short oval. *Legs* long; *femora* and *tibiæ* compressed, the latter spined beneath.

Long. 8·6 mm.

Type in B.M.

Described from a worker taken by W. Stalker in British New Guinea, Madew, St. Joseph River, 2000–3000 ft., 1909–22.

Camponotus (*Myrmosaulus*) *singularis* Smith, var. *rufomaculatus*, var. n.

Head red, thorax black, except several patches of red on the pronotum (less noticeable in the ♃), and the mesonotum mostly red; gaster, legs and antennæ black, clothed with greyish-yellow pubescence, and fine long pale yellow outstanding hairs.

Long. ♃ 16 mm.; ☿ 12·5 mm.

♃ and ☿ types in B.M. Coll.

Described from a soldier and a worker taken by Dr. B. M. Hobby in Borneo, Sarawak, in a clearing at the foot of Mt. Dulit, at the junction of the Rivers Tinjar and Leck, 11, x. 1933.

This variety differs from the typical form in being less pubescent, and the pubescence not having a golden tint; in having red patches on the thorax, and the upper surface of the node of the petiole more strongly sculptured.

There are a number of workers of *singularis* in the British Museum, none of which show any trace of red on the thorax.

The type locality for *singularis* is Java; it has also occurred in Sikkim, Indo-China, Sumatra and Borneo.

Polyrhachis (*Myrma*) *moorei*, sp. n.

☿. Black, covered with a pale slightly yellowish-grey pubescence and clothed with a few pale yellow outstanding hairs, more abundant on last three segments of gaster, above and below. The sculpture of the whole body is very finely reticulate.

Head longer than broad, narrowed in front of eyes and rounded behind, posterior angles bluntly rounded, posterior border slightly projecting in middle and sinuate on each side ; *mandibles* long, triangular, armed with five sharp strong teeth, rather strongly longitudinally striate and punctate ; *clypeus* large, triangular, not very convex, anterior border projecting, slightly sinuate in middle ; *frontal area* very indistinct ; *frontal furrow* fine, extending between the frontal carinæ about as far as base of lobes ; *frontal carinæ* rather close together, edges raised and sharp, sinuate in front and behind, forming not very prominent lobes ; *eyes* very prominent, situated considerably behind centre of sides of head ; *antennæ* long, *scape* extending beyond pro-mesonotal suture, all the joints longer than broad, first joint as long as the two following taken together. *Thorax* margined at sides, narrowed to base ; *pronotum* transverse, not very convex, anterior angles armed with a triangular, sharply-pointed, not very long tooth projecting outwards ; *pro-mesonotal suture* fine but distinct ; *mesonotum* transverse, about half as long as pronotum, sides rounded, forming an angle at junctions with pro- and epinotum ; *meso-epinotal suture* indistinct above ; *epinotum* with dorsal surface longer than the declivity, rather flat, armed on each side at base with a small sharply-pointed tooth projecting forwards ; *declivity* concave ; *gaster* short oval.

Long. 6·3 mm.

Type in B.M.

Described from a worker taken by Dr. A. Moore, Philippine Is., Luzon, Baguio, 17. ii. 1920.

" Site—under a stone, Waterfall Valley, Baguio."

" Eggs, larvæ, pupæ and adult ants."

This insect comes in the *zopyrus* group, consisting of rather small species of *Myrma*.

It is very like *punctillata* Roger, from Ceylon, in appearance, sculpture, etc., but in the latter ant the centre teeth of the *petiole* are considerably longer than those at the side.

Polyrhachis (*Cyrtomyrma*) *rastellata* Latr., var. *semi-inermis*, var. n.

☿. Black, shining, articulations of scape, palpi, apex of trochanters and base of femur narrowly, extreme tip of

antennæ, spurs and claws reddish yellow. Clothed with a few outstanding pale yellow hairs, and very short, fine, sparse, decumbent little yellow hairs. The sculpturation consists of the usual fine reticulation and small punctures.

The *head* is narrower and not so massive as in the typical form, more narrowed in front, not so broad and more abruptly rounded behind eyes; *mandibles* less massive *Thorax* narrower, not so robust, more rounded in front and narrowed behind, *shoulders* quite round; *pro-mesonotal* suture less deep and broad, no trace of *meso-epinotal* suture; *epinotum* entirely unarmed. The *scale* of the *petiole* is considerably narrower than in *rastellata*, the sides are straight, and there are no teeth to the external angles; two extremely small, short, pointed teeth are present in middle of upper border, another close together, the space between being slightly sinuate.

Long. 6 mm.

Type in B.M.

Described from two workers taken by Dr. A. Moore, Philippine Is., Luzon, Baguio, 28. ii. 1920.

" Site—empty cell in back of nest found in tree."

This variety comes in our group with the shoulders rounded and the epinotum unarmed.

The scale is unlike that of any other *Cyrtomyrma* known to us; or of any of the scales figured in our paper on *Cyrtomyrma* [Ann. & Mag. Nat. Hist. (s. 11) i. pp. 246–267, 16 text-figs. (1938)].

XVIII.—*Entomological Expedition to Abyssinia*, 1926–27. *Diptera Cyclorrhapha*: Muscidæ, I. By F. I. VAN EMDEN (Imperial Institute of Entomology).

THE present material has been worked out simultaneously with and shortly after the large collection obtained by the British Museum Ruwenzori Expedition, and this report is, therefore, supplementary to that on the Ruwenzori Fauna (British Museum Ruwenzori Expedition, 1934–5, Vol. II: Muscinæ and Stomoxydinæ, pp. 49–89 (1939); Cœnosiinæ, pp. 91–255 (1940); Scatophaginæ, Anthomyiinæ, Lispinæ, and Fanniinæ, in print). The latter report (comprising all the above-mentioned sections) is cited in the present paper by the abbreviation R.E., with the number of the page. The same abbreviations are used, and literature and synonymy are only cited as far as they are additional to information contained in that paper or in Séguy, 1937, Gen. Ins., fascic. 205, Muscidæ.

Of the 286 Muscidæ collected by Dr. Hugh Scott and Mr. J. Omer-Cooper in Abyssinia, 81 belong to the Phaoniinæ and will be worked out later. The remaining material has now been studied; it covers the following subfamilies:—Scatophaginæ (1 species, 9 specimens); Anthomyiinæ (4 species and 1 subspecies, represented by 23 specimens); Lispinæ (3 species, 20 specimens); (Fanniinæ absent); Cœnosiinæ (20 species, 86 specimens); Muscinæ (9 species, 51 specimens); and Stomoxydinæ (4 species, 16 specimens), making a total of 41 species and one subspecies, all together represented by 205 specimens. A comparison with published results of previous expeditions would make the present collection appear a rich one. However, at least an equal number of species, which were not obtained, have either been reliably recorded from Abyssinia or are distributed north as well as south of that country, so that they almost certainly occur in it, and the results of the British Museum Ruwenzori Expedition, the members of which collected 169 species and subspecies of the same subfamilies, suggest that even 80 species will not represent half the number of actual Abyssinian species *. Reserve is therefore warranted in drawing any

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* In Great Britain and Germany (Karl, 1928, Tierwelt Deutschl. 13, Diptera III., Muscidæ) totals of approximately 269 and 285 species of these subfamilies (excluding Scatophaginæ) respectively occur (Anthomyiinæ respectively 163 and 156, Lispinæ 9 and 14, Fanniinæ 38 and 47, Cœnosiinæ 42 and 44, Muscinæ 14 and 21, Stomoxydinæ 3 and 3). The British figure was obtained from a count of the names written out in the British collection of the British Museum, which are based on the results of the work of British collectors, particularly Mr. J. E. Collin.

[I should add to Dr. van Emden's interesting remarks, that neither I nor Mr. Omer-Cooper concentrated on collecting Diptera. The groups of insects, on which we mainly relied to throw light on the biogeographical problems which prompted us to undertake the journey, were Coleoptera, and after them Orthoptera and certain other Orders. I always regarded Diptera as a side-issue, in which I must get as much material as I could by the way, but could not hope to take more than a comparatively small sample. The leader of the Ruwenzori Expedition, on the other hand, was a very distinguished Dipterist, who naturally gave his own Order a first place.—Hugh Scott.]

conclusions of a zoogeographical nature from the present list. The following facts, however, seem to be reasonably safe :—the Anthomyiinæ, and especially the Scatophaginæ, are poorly represented in Abyssinia as in the Ethiopian region generally (see R.E.), whereas they predominate more or less in the Northern Hemisphere ; while the Cœnosiinæ are very richly developed (see R.E.). No marked Palæarctic elements can be found in the material except such as are widely distributed in the Ethiopian region.

Forms possibly endemic to Abyssinia and Eritrea are : *Hylemyia flavibasis dispar* Bezzi, *Caricea inanis* Stein, and the new species (except *Microcalyptra nigrifemur*).

Forms probably confined to high elevations in East Africa are : *Hylemyia virgithorax* Stein, the species of *Microcalyptra*, *Cœnosia heterocnemis* Emd., *Morellia edwardsi* Emd., *Musca lasiopa* Villen., and perhaps *Lispe ambigua* Stein and *Caricea similis* Stein.

Possibly confined to the East African countries from North Tanganyika to the Sudan : *Lispe dichæta* Stein, *Atherigona steeleæ* Emd., *Caricea atroapicata strigaria* Curr., *Graphomyia parvipuncta* Brun., and *Orthellia rhingiæformis* Villen.

Circumtropical (except for America) and European or Mediterranean : *Orchisia costata* Meig. and *Musca sorbens* Wied.

Cosmopolitan : *Stomoxys calcitrans* L., *Scatophaga stercoraria* L.

The remaining species are more or less widely distributed in the Ethiopian region, and some of them reach, unchanged or represented by another race, the Mediterranean subregion or even Europe.

Of the species collected by the Expedition four are new to science and are here described, though two of them were shortly described in the keys in R.E., pp. 221 and 236. The *types*, together with a first set of all the material collected by the Expedition, are in the British Museum. A fifth new species from Abyssinia was found in the collection of the British Museum ; it was collected by R. J. Stordy, and its description is included in this paper.

Note on the locality-lists.—All the specimens collected by Dr. Scott and Mr. Omer-Cooper were taken between September, 1926, and January, 1927 (both inclusive). In the detailed records, therefore, the year is not mentioned, though the month (and usually the day) is given. As to material from Abyssinia in the British Museum, obtained by earlier collectors, the year is generally given ; in the present paper this concerns certain specimens collected in 1911 by Col. R. J. Stordy on his journey from the southern frontier to Addis Ababa, and others taken by the Hungarian collector, O. Kovacs, in (or about) 1914.

Thanks are due to Mr. Arthur Smith for his conscientious execution of the drawings.

Scatophaga stercoraria L.

Loc. Abyssinia : Addis Ababa, over 8000 feet, 8. ix, 1 ♂, swept in the field of the Imperial Hôtel ; Jem-Jem Forest, 8000–9000 feet, 21. ix–1. x, 4 ♂, 2 ♀ ; Mt. Chillálo, forest, ca. 9000 feet, 14. xi, 2 ♀ (all *Scott*) ; Maraquo (Guragé Country), viii. 1914 (*O. Kovacs*) ; Southern Abyssinia*, 30. x, 1911 (*R. J. Stordy*).

Cosmopolitan.

Anthomyia spinigera Mall.

Loc. Abyssinia : Mt. Zukwala, ca. 9000 feet, 21–25. x, 4 ♂ (*Scott*) ; Jem-Jem Forest, 8000–9000 feet, 21–29. ix, 1 ♂, 2 ♀ (*Scott* and *Omer-Cooper*) ; Wachacha Ravine, near Addis Ababa, ca. 8000 feet, 9. ix, 1 ♂ (*Scott*).

Sudan to Southern Rhodesia (R.E.).

Anthomyia pluvialis tempestatum Wied.

Loc. Abyssinia : Addis Ababa, 10. x, 1 ♀ (*Omer-Cooper*) ; also specimens without exact record of locality, 1911 (*R. J. Stordy*) ; and recorded from Djerrer Valley, Lake Haramaiya, and Dire Dawa, by P. Stein.

Typical locality unknown. In the British Museum from Yemen, Kenya, Cape Province, Natal, and Transvaal; seen from Southern Rhodesia.

Hylemyia flavibasis Stein

Loc. Abyssinia : Doukam, 6500–7000 feet, 18–20. x, 1 ♀ (*Scott*) ; Maraquo (Guragé Country, south-west of Addis Ababa) (*O. Kovacs*).

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* See footnote on p. 224.

Typical localities: Egypt (Alexandria, Cairo, Assiut, Luxor, Fayûm, Assuan); of *linearis* Ad.: Southern Rhodesia (Salisbury). In the British Museum also from Corsica, South-West Arabia, Kenya, Southern Rhodesia, Transvaal, Natal, Cape Province.

Hylemyia flavibasis dispar Bezzi

Loc. Abyssinia: Jem-Jem Forest, ca. 8000 feet, 23. ix, 3 ♂, 4 ♀ (*Omer-Cooper*); Addis Ababa, over 8000 feet, 10. x, 1 ♀ (*Omer-Cooper*), and 8. ix, 2 ♂ (*Scott*); Mulu, above Muger Valley, ca. 8000 feet, from marshy ground, 18–23. xii, 1 ♀ (*Scott*).

Typical localities: Eritrea (Adi Ugri, Adi Caiè, Ghinda, Asmara, Keren, Otumlo, Halibaret, Mai-Atal).

Hylemyia virgithorax Stein

Loc. Abyssinia: Mt. Zukwala, ca. 9000 feet, 22. x, by sweeping rushes in lake, 1 ♂ (*Omer-Cooper*); Jem-Jem Forest, nearly 9000 ft., 24. ix, 1 ♀ (*Scott*).

Typical locality: Abyssinia (Dire Dawa). Known from: Kilimanjaro, Mt. Elgon, Mt. Kenya, Aberdares, Kikuyu Escarpment (R.E.).

Lispe ambigua Stein

Loc. Abyssinia: Mulu, above Muger Valley, ca. 8000 feet, from marshy ground, 18–23. xii, 11 ♂, 2 ♀ (*Scott*); Mt. Zukwala, ca. 9000 feet, 22. x, 1 ♀ (*Omer-Cooper*); Wouramboulchi, Serpent Lake, ca. 9000 feet, 5. x, 1 ♂ (*Omer-Cooper*).

In the British Museum also from Kenya (R.E.).

The third ventrite has a peculiar formation in the male, the base being prolonged into a spine, which is directed forward and ventrad over the apex of the second ventrite.

Lispe maculata Stein

Loc. Abyssinia: cultivated country near Addis Alam, ca. 8000 feet, 18–19. ix, 1 ♂ (*Scott*); between Addis Alam and Jem-Jem, 7000–8000 feet, swept in grass-fields, 20. ix, 2 ♀ (*Omer-Cooper*).

Typical locality: Southern Rhodesia (Salisbury). In the British Museum from Southern Rhodesia. Seen from Kenya.

Lispe (*Chætolispa*) *dichæta* Stein

Loc. Abyssinia: marsh near Lake Hora Abjata, ca. 5000 feet, 18. xi, 1 ♀ (*Omer-Cooper*); Mt. Zukwala, ca. 9000 feet, 22. x, by sweeping rushes in lake, 1 ♂ (*Omer-Cooper*).

Typical locality: Abyssinia, Lake Dembel (=Lake Zwai). Seen from Kenya. In the British Museum from Tanganyika, Morogoro (*A. Loveridge*).

Atherigona lævigata Loew

Loc. Abyssinia: Doukam, 6500–7000 feet, 18–20. x, 1 ♂ (*Scott*); marsh near Lake Hora Abjata, ca. 5000 feet, 18. xi, 2 ♀ (*Omer-Cooper*).

Southern Rhodesia and Portuguese East Africa to Abyssinia and South-West Arabia (R.E., p. 113); Seychelles.

Rather pale specimens, the male having the mesonotum ferruginous laterally up to the three vittæ and even to some extent between the front part of the vittæ; the female having the dorsum of the thorax yellow except for a dark brown median vitta, which is dilated behind up to the *prsc dc*; the lateral dorsal part of the scutellum in the female with a ferruginous streak. In both females the occiput is rather dusted on its dorso-lateral surface, as in the form from the Seychelles identified by Stein as *scutellaris*.

Atherigona ruficornis Stein

Loc. Abyssinia: Doukam, 6500–7000 feet, from flowers of *Cordia abyssinica*, 19. x, 1 ♀ (*Scott*); Maraquo (Guragé Country), viii. 1914 (*O. Kovacs*).

Southern Rhodesia to Abyssinia and South-West Arabia (R.E., p. 121).

Atherigona perfida Stein

Loc. Abyssinia: Jem-Jem Forest, ca. 8000 feet, 23. ix, 1 ♂ (*Omer-Cooper*); cultivated country near Addis Alam, ca. 8000 feet, 18–19. ix, 1 ♀ (*Scott*); Wouramboulchi, Serpent Lake, ca. 9000 feet, 5. x, 1 ♀ (*Omer-Cooper*); Maraquo (Guragé Country), viii. 1914 (*O. Kovacs*).

Southern Rhodesia (Mt. Chirinda) and Tanganyika to Abyssinia (R.E., p. 126).

Atherigona trapezia Emd.

Loc. Abyssinia : Jem-Jem Forest, ca. 8000–9000 feet, 21–29. ix, 2 ♂. 7 ♀ (*Scott*) ; Wouramboulchi, Serpent Lake, ca. 9000 feet, x, 1 ♀ (*Omer-Cooper*).

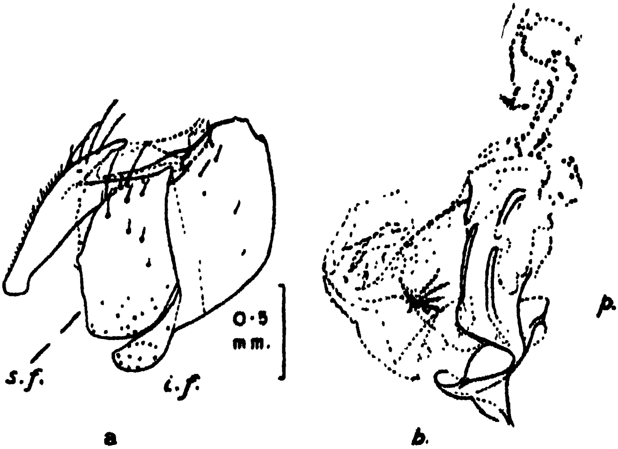
Southern Rhodesia (Mt. Chirinda) to Sudan (R.E., p. 127).

Atherigona steeleæ Emd.

Loc. Abyssinia : Mt. Chillálo, forest, ca. 9000 feet, 14. xi, 1 ♀.

Uganda to Sudan (R.E., p. 129).

Fig. 1.



Schœnomyza litorella Fall., male genitalia.
a, superior (*s.f.*) and inferior (*i.f.*) forcipes. *b*, penis (*p*).

Schœnomyza litorella Fall.

Loc. Abyssinia : Mt. Zukwala, ca. 9000 feet, 22. x, by sweeping rushes in lake, 1♂, 6 ♀ (*Omer-Cooper*) ; Wouramboulchi, Serpent Lake, ca. 9000 feet, 5. x, 1 ♂ (*Omer-Cooper*) ; Mulu, above Muger Valley, ca. 8000 feet, 18–23. xii, 1 ♀ (*Scott*).

Typical locality : Sweden (Esperöd, Baltic coast). Recorded from Europe, Caucasus, North America and

Africa. In the British Museum from Great Britain, Natal, and Cape Province.

The only African species of *Schœnomyza* has always been identified as *litorella* Fall. (Stein, 1914, Voy. Alluaud et Jeannel Afr. or., Dipt. 4, p. 142), but the few males I have seen so far have the face dark velvety-brown and only the jowls golden-red, whereas in the available European specimens the face is entirely golden-yellow to golden-red. I can, however, find no other difference, not even in the genitalia (fig. 1).

MICROCALYPTRA Stein

Only one species, *M. abnormis* Stein, which is therefore the genotype, was hitherto known, but Stein mentioned that in one of his two males the front femora are entirely black. This is no doubt the species here described as *nigrifemur*, which Stein's description obviously treats as an aberrant form, the one with the pale femora being the type of *abnormis*. The material of the British Museum Ruwenzori Expedition contains only a single, broken specimen of *nigrifemur*, which was mentioned without a specific name in the report on that collection (R.E., p. 143). The present material contains the two species, each represented by several specimens, and a single male of a remarkable third species.

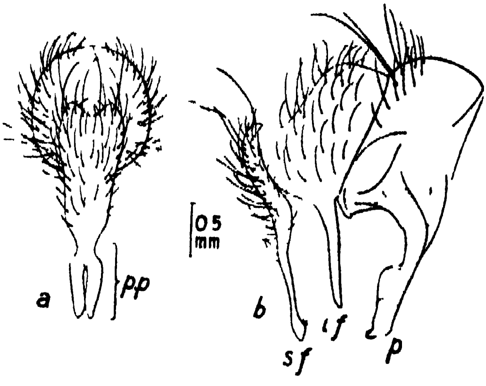
Key to the Species of Microcalyptra.

1 (2). **Front femora in male wholly pale ferruginous, in female the apical two-fifths or less piceous, mid-femora wholly pale ferruginous, hind femora pale ferruginous with the apical quarter or less piceous. Tarsi piceous. Hind tibiæ of male without an *av* seta, the short hair erect only on *av* and *pv* surfaces, appressed on *d* and *v* surfaces. Abdomen, scutellum, and the two black sublateral vittæ of thorax strongly shining, the latter not, the former two slightly, dusted. Superior forceps with a long dorsal groove, looking as though cleft from apex almost to middle; inferior forceps paired, very narrow, rod-shaped (fig. 2) ....** ***abnormis*** **Stein.**

2 (1). **Front femora black with the apex very narrowly ferruginous in both sexes. Superior forceps only slightly notched at apex.**

3 (4). **Abdomen, scutellum and the thoracic vittæ strongly shining, the latter not, the former**

Figs 2–4



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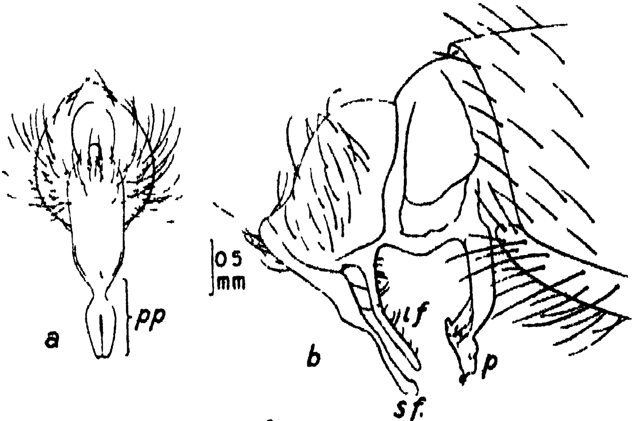

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Fig. 2.—*Microcalyptra abnormis* Stein, male genitalia. *a*, superior forceps ; *p.p.*, pale part. *b*, lateral view ; *s.f.*, superior forceps ; *i.f.*, inferior forceps ; *p*, penis.

Fig. 3.—*Microcalyptra nigrifemur* sp. n., male genitalia. *a*, superior forceps ; *p.p.*, pale part *b*, lateral view ; *s.f.*, superior forceps ; *i.f.*, inferior forceps ; *p.*, penis

two slightly, dusted. Tarsi piceous. Hind tibiæ of male without a distinct *av* seta, the hairs erect all over ventral, and single ones even on *pd* and *ad* surfaces. Mid- and hind femora of female black. Inferior forceps rod-shaped (fig. 3) .... ***nigrifemur***, sp. n.

4 (3). Abdomen, scutellum and the thoracic vittæ not very shining, more densely dusted. The basal three joints of the tarsi with the base of each narrowly infuscate to black. Hind tibiæ of male with an *av* seta, the hair short and appressed everywhere, only the *pd* surface with a row of slightly longer, half-appressed hairs in apical half. Inferior forceps band-shaped, gradually and very slightly widened to apex (fig. 4) ♂...... ***pœcilotarsis***, sp. n.

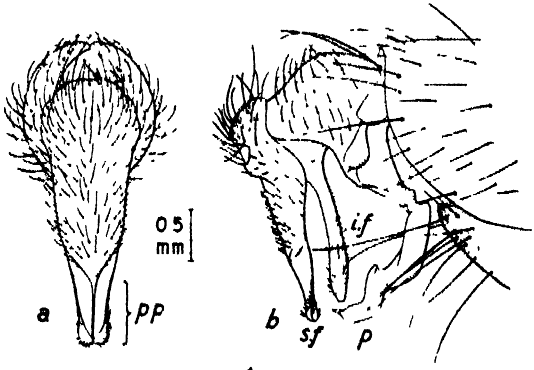

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Fig. 4.—*Microcalyptra pœcilotarsis* sp. n., male genitalia. *a*, superior forceps; *p.p.*, pale part. *b*, lateral view; *s.f.*, superior forceps; *i.f.*, inferior forceps; *p.*, penis.

Microcalyptra abnormis Stein

Loc. Abyssinia: Jem-Jem Forest, nearly 9000 feet, 24. ix, 1 ♂, 1 ♀ (*Scott*); Mt. Chillálo, forest, ca. 9000 feet, 14. xi, 1 ♀ (*Scott*).

Typical locality: Dire Dawa.

Microcalyptra nigrifemur, sp. n., ♂ ♀

Length, 3·0–4·1 mm.; *of wings*, 2·4–3·1 mm.

♂. ***Head*** black, densely grey, parafrontalia, parafacialia and jowls golden-grey, dusted, interfacialia and interfrontalia black dusted, upper lateral part of occiput thinly dusted and therefore fuscous, frontal triangle and median stripe on upper half of occiput brown dusted. Frons slightly wider at vertex than one eye, very slightly widened to apex, not quite twice as long as wide, interfrontalia sub-parallel, parafrontalia almost half as wide as interfrontalia, with about six inclinate setæ and hairs, the second and last but one moderately strong, the last very small, the others weak. Ocellars two-thirds as long as frons, inner vertical strong, outer vertical moderately strong, postverticals small. Antennæ fuscous, inserted at dorsal third of eyes, where the frons projects by less than the width of the antennæ, third antennal joint less than thrice as long as wide, not quite reaching level of lower eye-margin, falling short of mouth-margin by at least its own width; arista sparsely short-pubescent on dorsal surface, the longest hairs shorter than its basal diameter. Palpi fuscous. Parafacialia more than half as wide, jowls one-and-a-half times to twice as wide as third antennal joint.

Thorax glossy black, the pleuræ, except humeri, pteropleura and supraspiracular convexity, and a pair of vittæ along the *dc*, as wide as their distance from each other, not very densely grey dusted, scutellum very thinly greyish dusted. *acr* almost absent, in two vestigial rows, very small and extremely sparse; 1+2 strong *dc*, *ph* absent, *prst* strong, one strong humeral, one moderate and one fine notopleural, *post ia* and *pra* absent, anterior postalar fine, *sa*, posterior postalar and apical scutellars very strong, scutellum moreover with a pair of setulæ near base of margin and a few fine, small hairs. Upper propleural and prostigmatal rather weak, lower propleural weak, lower prostigmatal hairlike, curved downward. *stpl* in a triangle, the anterior side of which is much shorter, lower *stpl* rather weak, anterior one moderately strong, posterior one strong.

Abdomen glossy black, with very thin greyish dust; elongate, rather strongly narrowed and compressed to apex, without distinct setæ, hair fine and not very dense, short and appressed on dorsum, half-erect at sides, apex with a few long, fine hairs. Lobes of fourth ventrite narrow and elongate, separated by a very deep and long excision which is not wider than one lobe, with a row of 3–4 stronger setulose hairs. Apical pale part (*p.p.* in fig. 3*a*) of superior forceps more than two-thirds as long as basal dark part, separated from it by a deep emargination on either side, apex slightly notched ; inferior forceps paired, very slender and rod-shaped.

Legs : coxæ, trochanters, tarsi and front femora and tibiæ, except for the base of the latter, black to piceous, coxæ and tibiæ rather densely dusted, mid- and hind femora and tibiæ (except for the apical sixth to eighth of the hind femora, which is piceous), and base of front tibiæ, testaceous. Front femora with 6–8 fine *pv* and *pd* setæ, front tibiæ with a rather fine *pv* seta ; mid-femora with a short but rather strong *a* seta at two-thirds and a *p* preapical, mid-tibiæ with a strong *ad* and a moderate *pd* almost at three-fifths ; hind femora with six *ad* of which 3–4 are rather strong, two strong and long *av* beyond a quarter and before three-quarters, and a *pd* preapical, hind tibiæ with a strong submedian *ad* seta, the *av* long and very fine, hair-like, the hair on the *av*, *v* and *pv* surfaces fine and erect, some of it longer than the tibial diameter, some of the hairs on *pd* and *ad* surfaces also erect.

Wings hyaline, usually very slightly smoky along the veins, the latter brown with testaceous base ; r_{4+5} and *m* subparallel at apex, *r*-*m* slightly beyond middle of discal cell, apical section of *m* almost as long as discal cell. Calyptræ whitish, with yellowish-white border and fringe, very small, the lower one subtriangular and slightly projecting beyond the upper one. Halteres pale ferruginous.

♀. Parafrontalia, etc., pale grey dusted. Abdomen depressed and pointed. Mid- and hind femora glossy black to piceous (only the posterior tibiæ and the base of the front tibiæ remaining testaceous), hind tibiæ with a conspicuous *av* seta beyond middle, the hair appressed and short.

Loc. Abyssinia : Wouramboulchi (beyond Jem-Jem Forest), Serpent Lake, ca. 9000 feet, 5. x, ♂ type, 3 ♂, 5 ♀ paratypes (*Omer-Cooper*) ; Mt. Zukwala, ca. 9000 feet, 21–25. x, 1 ♂, 1 ♀ paratypes (*Scott*), and 22. x, by sweeping rushes in lake, 1 ♀ paratype (*Omer-Cooper*) ; Mt.

Chillálo, forest, ca. 9000 feet, 14. xi, 1 ♀ paratype (*Scott*); recorded from Dire Dawa by Stein (see p. 217).

Kenya: Mt. Elgon, heath zone, 10,500–11,500 feet, ii, 1935, 1 ♂ paratype (*F. W. Edwards*).

Microcalyptra pœcilotarsis, sp. n., ♂.

Length, 3·3 mm.; *of wings*, 2·2 mm.

Head black, densely whitish-grey dusted, upper part of occiput less densely brownish-grey dusted, interfrontalia and interfacialia black, the latter velvety. Frons distinctly wider at vertex than one eye, subparallel, less than twice as long as wide, interfrontalia slightly narrowed anteriorly, parafrontalia near middle a quarter the width of the interfrontalia, with four inclinate setæ, the first and third moderately strong, the others weak. Ocellars two-thirds the length of frons, inner and outer verticals rather strong, postverticals rather small. Antennæ black with fuscous pile, inserted not much above middle of eyes, where the frons projects by less than width of antennæ, third antennal joint less than thrice as long as wide, not quite reaching level of lower eye-margin, falling short of mouth-margin by more than its own width; arista with very short pubescence, the longest hairs shorter than its basal diameter. Palpi fuscous. Parafacialia half as wide, jowls one-and-a-half times as wide, as third antennal joint.

Thorax fuscous, rather thinly brown dusted, dorsum moderately shining, with a not very conspicuous pair of cinereous vittæ along *dc* or rather a narrow line along outer and inner side of each *dc* row, pleuræ not very densely grey dusted, scutellum very thinly greyish dusted. *acr* almost absent, in two vestigial rows, very small and extremely sparse; 1+2 strong *dc*, *ph* small, *prst* and one humeral strong, two rather small notopleurals, *post ia* and *pra* absent, anterior postalar fine, posterior postalar and apical scutellars very strong, scutellum moreover with a pair of very small setulæ near base of margin and a few minute hairs. Upper propleural and prostigmatal weak, lower ones minute. *stpl* in a triangle, the anterior side of which is considerably shorter, lower *stpl* rather weak, the others strong.

Abdomen fuscous, moderately shining, with distinct though not very dense brownish-grey dust; the latter brown on a faint median vitta and paired spots; elongate, gradually but rather strongly narrowed to apex, without setæ, the hair fine, short and appressed, apex with a few long hairs. Lobes of fourth ventrite narrow and elongate, separated by a very deep and long excision which is not quite as wide as one lobe, apical two-thirds with long, setulose hairs. Apical pale part (*p.p.* in fig. 4 *a*) of superior forceps one-third the length of the basal dark part, not separated by an emargination, apex rather broadly truncate, slightly notched; inferior forceps paired, band-shaped, gradually very slightly widened to apex.

Legs coloured as in *nigrifemur*, but the basal three tarsal joints testaceous with the base of each joint narrowly infuscate or, on the front tarsi, blackened, the apical two joints piceous. Front femora with six rather small *pd* and five longer *pv*, the latter alternating with fine setæ, front tibiæ with a strong *pv* beyond middle; mid-femora with a short, moderately strong *a* seta at two-thirds, some finer, not very distinct ones between it and base, a *p* and *pd* preapical, and 4–6 fine *pv* in basal two-thirds; mid-tibiæ with a strong *ad* and a slightly shorter *pd* at middle; hind femora with about eight *ad* of which the two last and two others are rather strong, a strong *av* at one-third and two-thirds, a strong *av* preapical, and a *pd* preapical; hind tibiæ with a strong submedian *ad* and a rather strong *av* somewhat beyond it, hair normal, appressed.

Wings strikingly short and rather narrow, only two-and-a-fifth times as long as thorax, very slightly smoky, veins brown, r_{4+5} and *m* subparallel at apex *r–m* slightly beyond middle of discal cell, apical sector of *m* somewhat shorter than discal cell. Calyptræ smoky-hyaline, with whitish border and fringe, very small, the lower one shortly subtriangular, not projecting beyond the upper one. Halteres pale testaceous.

Loc. Abyssinia: Mt. Chillálo, moorland, ca. 12,000–13,000 feet, 21. xi, ♂ type (*Scott*).

A female, which was found at the same place, cannot be distinguished from *nigrifemur* and will probably prove to be that species, as the female of *pœcilotarsis* may be expected to be more dusted.

Cœnosia heterocnemis Emd.

Loc. Abyssinia: Mt. Chillálo, moorland, ca. 12,000–13,000 feet, 21. xi, 1 ♀, and forest, ca. 9000 feet, 13. xi, 1 ♂ (teneral) (both *Scott*).

Aberdare Mts. and Mt. Elgon (R.E., p. 148).

The specimens are quite identical with the Kenya series in all their characters The lower calyptra, however, is still smaller, more broadly rounded, and does not project beyond the upper one.

Caricea humilis multimaculata Ad.

Loc. Abyssinia: Lake Hora Abjata, 18. xi, 1 ♂, and marsh near by, ca. 5000 feet, 18. xi., 4 ♀; Mt. Zukwala, ca. 9000 feet, 22. x, by sweeping rushes in lake, 1 ♀ (all *Omer Cooper*).

Cape Province (Ceres, *Miss A. Mackie*) to Sudan, and Yemen (R E., p. 179).

Caricea inanis Stein

Loc. Abyssinia: between Addis Alam and Jem-Jem, 7000–8000 feet, 18–20. ix, swept in grass-fields, 1 ♂, 4 ♀; Mt. Zukwala, ca. 9000 feet, 22. x, by sweeping rushes in lake, 3 ♀ (both *Omer-Cooper*); Boru stream, north of Mt. Chillálo, ca. 7500 feet, 29. xi, 1 ♀ (*Scott*).

Type locality: Abyssinia.

Caricea atroapicata strigaria Curr.

Loc. Abyssinia: Mt. Chillálo, forest, ca. 9000 feet, 14. xi, 1 ♂ (*Scott*); Jem-Jem Forest, ca. 8000 feet, 5–10. x, 1 ♀ (*Scott*); Southern Abyssinia *, 30. x. 1911 (*R. J. Stordy*).

West Tanganyika, Kenya (R.E., p. 203).

Caricea similis Stein

Loc. Abyssinia: Mulu, above Muger Valley, ca. 8000 feet, 18–23. xii, 1 ♂ (*Scott*).

Tanganyika, Kenya (R.E., p. 205).

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* Only "Southern Abyssinia" can be given, since on the printed label two quite distinct places, one about 100 miles north of the other, are confused. The label reads "Higo Samula," but Col. Stordy has told me that Higo is in the Borana country, 75 miles north-east of Moyale, while Samalu (not "Samula") is 6 miles south of Gatelo, east of the south end of Lake Abaya. Unfortunately the same label is attached to many specimens in the British Museum.—Hugh Scott.

Caricea velutinifacies Emd., ♂ (R.E., p. 221).

Length, 3·9–4·5 mm.; *of wings*, 3·8–4·0 mm.

Head black, entirely velvety-black dusted, with brown reflections. Occiput hardly concave above, frons one-fifth wider at vertex than anteriorly, one-and-a-half times as long as wide, with straight sides, six-sevenths as wide in front as one eye, rather straight in profile, projecting anteriorly by almost width of antennæ; face hardly narrowed to base of arista, slightly dilated and weakly rounded to lower margin of eyes, where it is less than twice as wide as at narrowest point; parafrontalia not differently dusted, but recognisable in certain lights, a quarter the width of the interfrontalia in the middle, with three strong and 2–3 small inclinate setæ. Inner vertical strong, outer vertical absent, postverticals and ocellars long, the latter three-quarters the length of the frons. Antennæ velvety-black with brown reflections, third joint not quite thrice as long as wide, falling short of mouth-margin (which is rounded and moderately produced) by its own width; arista bare, except between thickened basal part and middle, where it bears very short pubescence, the longest hairs being shorter than the basal diameter. Eyes reaching level of mouth-margin. Palpi piceous-black. Parafacialia half, jowls almost, as wide as third antennal joint.

Thorax black, rather glossy, with some brown dust, without a pattern. *acr* well developed, in two rows with some additional hairs on postsutural part, the *prst* and *prsc* pairs somewhat longer; 1+3 strong *dc*, two moderate *post ia*; scutellum setulose with two pairs of very long and strong setæ. Posterior propleural and upper prostigmatal rather strong, lower prostigmatal not very strong, curved downward, surrounded by a few hairs. *stpl* in an almost equilateral triangle with fine erect hairs, the upper side slightly longer, anterior *stpl* moderately strong, lower one rather strong, posterior one very strong.

Abdomen black, rather glossy, with some brown dust and rather thin pale grey dust in front angles; somewhat depressed up to apex. Hair of dorsum appressed, each segment with a strong lateral seta, the third and fourth, moreover, with a dorsal seta on either side, fifth segment with a pair of long, somewhat incurved setulose hairs and some smaller erect hairs. Fourth ventrite with broad, hardly convex lobes and a rather broad excision between them.

Legs wholly black, with some brown dust. Front femora with 5–6 rather long and fine *ad* and seven long *pv*, alternating with smaller ones; front tibiæ with a very long and strong *pv* seta in middle and an additional postero-subdorsal preapical, level with the dorsal one; mid-femora with 6–8 moderately short *av* setæ from base to middle, a strong *a* seta at middle and two-thirds, and some small ones between them and base, four long *pv* and a *p* and *pd* preapical; mid-tibiæ with a moderate *pd* just beyond middle and a long and strong *ad* somewhat beyond the *pd*; hind femora with 7–8 strong *ad*, 4–6 moderate *av*, three long and fine *pv*, and a rather small *pd* preapical, hind tibiæ with a very long and strong *ad* and a slightly shorter *a* seta at middle.

Wings brownish with dark brown veins, which are somewhat lighter at base, r_{4+5} and *m* slightly converging before apex but slightly diverging at the very apex, *r–m* distinctly before middle of discal cell. Calyptræ strikingly white with white border and fringe, the lower projecting beyond the upper one by twice the length of the latter, distinctly reaching level of first abdominal segment, subparallel in middle, rather broadly rounded at apex. Halteres blackish-brown.

Loc. Abyssinia: Wouramboulchi (beyond Jem-Jem Forest), Serpent Lake, ca. 9000 feet, 5. x, ♂ type, 1 ♂ paratype (*Omer-Cooper*).

Caricea nestor Curr.

Cœnosia nestor Curran, 1935, Amer. Mus. Novit. 776, pp. 2, 5.

Loc. Abyssinia: Wachacha Ravine, near Addis Ababa, ca. 8000 feet, 9. ix, 1 ♂ (*Scott*); Addis Ababa, 10. x, 1 ♂, 1 ♀ (*Omer-Cooper*); Jem-Jem Forest, nearly 9000 feet, 24. ix, 1 ♀ (*Scott*); between Addis Alam and Jem-Jem, 7000–8000 feet, 20. ix, 3 ♀ (*Omer-Cooper*).

Typical locality: Addis Ababa.

Caricea fascigera Stein, var. ?

Loc. Abyssinia: Doukam, 6500–7000 feet, 19. x, from flowers of *Cordia abyssinica*, 1 ♂ (*Scott*).

Natal to Uganda and Kenya (R.E., p. 238).

The third antennal joint with arista and the front legs are missing. Head and frons distinctly wider than in *fascigera*, but pattern of thorax and abdomen and shape of the latter identical. Tibiæ and tarsi of middle legs entirely pale, of hind legs infuscate. This may be either an aberrant form of *fascigera* or a new species of the *humilis*-group. It would work out as *curvinervis* Emd. in my key, but the abdominal spots are fused into almost complete transverse bands as in *fascigera* and r_{4+5} is less curved.

Caricea megalocalyptra Emd., ♂♀ (R.E., p. 236).

Length, 3·9–4·9 mm. ; *of wings*, 4·0–4·6 mm.

Head black, grey dusted, face black (♂) or grey (♀) dusted, occiput slightly concave, fuscous dusted, jowls brown dusted (♂) or grey dusted (♀), interfrontalia dull black with whitish and, especially on the elongate frontal triangle, brown reflections, parafrontalia narrowly grey dusted. Frons rather straight in anterior half, slightly protruding in profile, three-fifths in front, almost four-fifths at vertex of width of one eye, sides straight from first inclinate seta to inner vertical, one-and-a-half times as long as wide at vertex ; face evenly dilated with almost straight sides from insertion of antennæ to lower margin of eyes, where it is two-and-a-third times as wide as at narrowest point ; parafrontalia very narrow, one-seventh as wide as interfrontalia in middle, with three moderate and 2–3 small inclinate setæ, and one not very strong reclinate seta. Inner vertical strong, outer vertical absent, postverticals conspicuous, ocellars rather strong, two-thirds the length of the frons. Antennæ black, second joint with brownish dust interiorly at apex, third with brown pile, thrice as long as wide, falling short of mouth-margin, which is slightly rounded and produced, by somewhat more than its own width ; arista with short pubescence in basal third, the longest hairs as long as its basal diameter, bare on apical two-thirds. Eyes almost reaching level of mouth-margin. Palpi fuscous. Parafacialia half, jowls almost as wide as third antennal joint.

Thorax black, dorsum, including scutellum, densely whitish pollinose (♂), or grey pollinose with a narrow brown median vitta and a broad brown vitta from *dc* to *ia*, which ends at second *ia* but is narrowly produced at its inner end to the last *dc* and base of scutellum, the pattern not very conspicuous (♀). *acr* rather long, in two rows with a few additional setulæ behind suture, the *prsc* rather strong, 1+3 strong *dc*, two rather strong *post ia* ; scutellum setulose with two pairs of strong setæ. Posterior propleural and upper prostigmatal rather strong, lower prostigmatal conspicuous, curved downwards, surrounded by a few hairs. *stpl* in a triangle, the posterior side of which is shorter, anterior *stpl* moderately strong, lower one strong, posterior one very strong.

Abdomen rather short, compressed at apex, with rather long hair (♂), spindle-shaped, pointed, rather convex, with short, appressed hair (♀), not very densely whitish-grey pruinose (♂), grey dusted with a not quite complete brown median vitta and a pair of roundish brown spots on first to third segments and of very small brown spots on fourth (♀), second segment with a strong lateral seta and 1–2 pairs of weaker setæ, third and fourth each with a transverse row of three pairs of strong setæ, fifth with a discal and a marginal pair of setæ, the latter stronger.

Legs wholly black. Front femora with 7–8 *pd* and 6–7 rather long *pv* setæ, the latter alternating with fine ones, *p* surface in male rather long-setulose, front tibiæ with a very long and strong submedian *pv* seta and an accessory postero-subdorsal preapical, level with the *d* preapical; mid-femora with an *a* row in basal two-thirds, the last 2–3 setæ of which are rather strong, about five rather strong *av* and *pv* setæ in basal half, the *av* not less strong but shorter, and a *p* and *pd* preapical, mid-tibiæ with a long and strong *ad* at three-fifths and a moderately strong *pd* not much before it ; hind femora with 8–9 strong *ad*, about seven *av*, most of which are rather short, three very long *pv*, and a *pd* preapical, hind tibiæ with a strong *ad* at middle and a somewhat weaker *a* seta at the same level.

Wings hyaline, veins dark brown at apex, somewhat lighter at base, r_{4+5} and *m* subparallel at apex, *r–m* at almost three-fifths to slightly beyond middle of discal cell. Calyptræ white with white border and fringe, the latter is absent on most of lower calyptra in male, where this calyptra is very large, almost six times as long and, behind middle, more than twice as wide as the upper one, and where its apex reaches the third abdominal segment ;

in the female it is two-and-a-half times as long and almost one-and-a-half times as wide as the upper calyptra, in both sexes it is considerably widened from base to middle or beyond it. Halteres pale testaceous to pale ferruginous.

Loc. Abyssinia: Jem-Jem Forest, nearly 9000 feet, 24. ix, ♂ type (*Scott*); Mulu, above Muger Valley, ca. 8000 feet, 18–23. xii, 1 ♀ paratype (*Scott*); Mt. Zukwala, ca. 9000 feet, 22. x, 2 ♀ paratypes (*Omer-Cooper*).

The head and, to a less extent, the abdomen of the type are crushed, and the description is therefore a joint one of both sexes, the characters of the head being largely taken from the female.

Caricea abyssinica, sp. n., ♀.

Length, 5·2–5·6 mm.; *of wings*, 5·4–5·8 mm.

Head black, grey dusted, median dorsal part of occiput fuscous dusted, interfrontalia black. Frons rather straight in side view, slightly protruding at base of antennæ, as long as face, at vertex three-quarters the width of one eye, one-half longer than wide, moderately narrowed with straight sides to front end, where it is one-fifth to one-sixth narrower than at vertex; fronto-facial stripe slightly rounded at sides opposite second antennal joint, rather evenly dilated with rather straight sides from apex of second antennal joint to lower margin of eye, where it is two-thirds wider than at vertex; parafrontalia almost one-third the width of the interfrontalia, with three strong and 3–4 weak inclinate setæ. Inner vertical strong, outer vertical absent, postverticals and ocellars rather long, the latter two-thirds the length of the frons. Antennæ fuscous with greyish-brown pile, third joint two-and-a-half times as long as wide, falling short of mouth-margin by one-and-a-half times its width; arista sparsely short-haired in basal third, bare beyond it, the longest hairs hardly longer than its basal diameter. Eyes almost reaching mouth-margin, the latter slightly produced and rounded. Palpi fuscous. Parafacialia one-third to one-half as wide, jowls as wide, as third antennal joint.

Thorax black, humeri and notopleuræ densely pale-grey dusted, rest of dorsum thinly grey dusted with a narrow median vitta, a pair of vittæ along the *dc* and extending over lateral part of scutellum, and another one along *ph*, *prst* and *ia*; behind the posterior *ia* the lateral vitta is interrupted by a pale band that connects the lateral pale dust with the pale dust between the two other dark vittæ and with the pale-dusted supraalar declivity; the pattern not very conspicuous. *acr* fine but distinct, in two rows with a few additional setulæ on the postsutural part, two pairs before suture and the *prsc* somewhat longer; 1+3 strong *dc*, two moderate *post ia*; scutellum setulose with two pairs of strong setæ. Posterior propleural and upper prostigmatal moderately strong, lower prostigmatal rather fine, curved downward, surrounded by a few long hairs. *stpl* in a triangle with long, erect hair, the upper side of which triangle is distinctly longer, anterior *stpl* moderately strong, lower one strong, posterior one very strong.

Abdomen oblong-oval, pointed at apex, black, thinly grey dusted, with a pair of not very distinct, triangular brown spots on segments two and three. Second segment with a strong lateral, third with a strong lateral and dorsal seta on either side, fourth with a transverse row of three pairs of not very strong setæ.

Legs wholly black, rather thinly grey dusted. Front femora with six long *pd* and very long *pv*, the latter alternating with very long hairs; front tibiæ with a very long and strong *pv* seta slightly before middle, with the normal two preapical setæ (and two apical spurs); mid-femora with about five stronger though rather small *av* in basal half, an *a* row, the setæ of which become gradually stronger, and which ends in two strong setæ beyond middle and at two-thirds, four long *pv* from base to three-fifths, and a strong *p* and *pd* preapical; mid-tibiæ with a rather strong *pd* in middle and a very strong *ad* somewhat beyond it; hind femora with six strong *ad*, a strong *av* at one-third and two-thirds, an *av* preapical, three *pv*, and a *pd* preapical; hind tibiæ with a very long and strong *ad* in middle and a somewhat shorter *a* seta almost level with it.

Wings somewhat smoky, veins dark brown, r_{4+5} and *m* slightly diverging at apex, *r-m* before middle of discal cell, the last two sections of *m* subequal. Calyptræ brownish white with yellowish-white border and fringe, the lower one projecting by twice the length of the upper one, sides subparallel in middle. Halteres pale ferruginous.

Loc. Abyssinia : southern part of country *, 30. x. 1911, ♀ type, 1 ♀ paratype (*R. J. Stordy*).

Closely related to *C. megalocalyptra* Emd., from which the present species is distinguished by the lack of an additional (postero-subdorsal) preapical on the front tibiæ, much broader parafrontalia and less dilated frons. The lower calyptra of the male may be expected to be normally developed and not so hypertrophic as in *megalocalyptra*. Also similar to *tripunctiventris* Mall., but in that species the head is not so high, the third antennal joint is shorter, the hairs of the arista are very much longer, the prostigmatal setæ not surrounded by hairs, while *r–m* lies much beyond the middle of the discal cell, the last section of *m* thus being nearly twice (♀) or more than twice (♂) as long as the last section but one.

Lispocephala miki Strobl

Loc. Abyssinia : Hawash River, west of Mt. Zukwala, ca. 6000 feet, 28. xi, 1 ♂ (*Omer-Cooper*) ; marsh near Lake Hora Abjata, ca. 5000 feet, 18. xi, 2 ♀ (*Omer-Cooper*) ; Mulu, above Muger Valley, ca. 8000 feet, 18–23. xii, from marshy ground, 3 ♀ (*Scott*).

Europe, Canary Is., Mediterranean, Kenya to Southern Rhodesia (R.E., p. 246).

Orchisia costata Meig.

Loc. Abyssinia : Addis Ababa, 10. x, 1 ♂, 1 ♀ (*Omer-Cooper*) ; Doukam, 6500–7000 feet, 18–20. x, 1 ♀ (*Scott*) ; cultivated country near Addis Alam, ca. 8000 feet, 18–19. ix, 1 ♂, 1 ♀ (*Scott*).

Southern Europe to Fiji and Samoa, apparently the whole of the Ethiopian Region, and Madagascar (R.E., p. 247).

Graphomyia parvinotata Brun.

Loc. Abyssinia : Jem-Jem Forest, nearly 9000 feet, 24. ix, 1 ♀ (*Scott*).

Kenya, Uganda (R.E., p. 60).

Morellia bispinosa Mall.

Loc. Abyssinia : Jem-Jem Forest, nearly 9000 feet, 24. ix, 2 ♂ (*Scott*).

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* See footnote under *Caricea atroapicata*, p. 224

Typical localities: Southern Rhodesia (Vumba Mts. and Umtali). In the British Museum from these localities and from Natal, Weenen (*H. P. Thomasset*).

A striking though not infallible character of this species and of *calyptrata* Stein is the yellowish to brimstone or lemon-yellow colour of the outer part of the upper calyptra, which is opaque white in other species. The female, which has not been described before, has the same coloration of the calyptræ, including the infuscate posterior part of the lower calyptra with whitish border and fringe. This sex is otherwise almost identical with that of *nilotica* Loew, but the two *av* setæ of the hind tibiæ are longer (as long as the tibial diameter), and the distal one is separated from the proximal one by only its own length, whereas in *nilotica* three are often present, and in any case the first and last are as widely separated as the last from the apex of the tibia.

Morellia edwardsi Emd.

Loc. Abyssinia: Mt. Zukwala, ca. 9000 feet, 21–25. x, 1 ♀ (*Scott*); in crater of the same mountain, 26. x, 1 ♀ (*Omer-Cooper*); Maraquo (Guragé country), 1914 (*O. Kovacs*).

Aberdare Mts. and Mt. Elgon (R.E., p. 63).

Orthellia rhingiæformis Villen.

Loc. Abyssinia: Mt. Zukwala, 9000 feet, 21–25. x, 2 ♂, 2 ♀ (*Scott*), and in its crater, 26. x, 2 ♂, 5 ♀ (*Omer-Cooper*); Addis Ababa, over 8000 feet, 8. ix, 1 ♂, 1 ♀ (*Scott*), 10. ix, 1 ♂ (*Omer-Cooper*); Jem-Jem Forest, 8000–9000 feet, 1–10. x, 1 ♂, 2 ♀ (*Scott*).

Kenya, Uganda, Belgian Congo (R.E., p. 73).

Musca cuthbertsoni Patton

Musca cuthbertsoni Patton, 1936, Ann. trop. Med. Paras. 30, p. 470.

Loc. Abyssinia: between Doukam and Mt. Zukwala, ca. 7000 feet, 20. x, 1 ♀ (*Scott*).

Typical localities: Southern Rhodesia, Uganda (Entebbe), Nyasaland. In the British Museum from: Orange Free State, Transvaal, Southern Rhodesia, Tanganyika, Zanzibar, Kenya. Seen from Sudan.

Musca sorbens Wied.

Loc. Abyssinia: Jem-Jem Forest, 8000–9000 feet, 21–29. ix, "tormenting in camp at meals," 1 ♂, 5 ♀ (*Scott*); between Addis Alam and Jem-Jem, 7000–8000 feet, 20. ix, swept in grass-fields, 2 ♀ (*Omer-Cooper*); between Doukam and Mt. Zukwala, ca. 7000 feet, 20. x, 1 ♂, 6 ♀ (*Scott*).

Very widely distributed (R.E., p. 82).

Musca tempestatum Bezzi

Loc. Abyssinia. Between Doukam and Mt. Zukwala, ca. 7000 feet, 20. x, 2 ♂ (*Scott*); north-west shore of Lake Zwai, ca. 5500 feet, 3. xi, 3 ♂, 5 ♀ (*Scott*).

Typical localities: Eritrea (Asmara, Massawa, Ghinda, Belek and Mareb). In the British Museum from: Eritrea, Sudan, Gold Coast, Sierra Leone, Nigeria, Kenya, Zanzibar, North-West Rhodesia. Seen from Uganda.

Musca lasiophthalma Thoms.

Loc. Abyssinia: Addis Ababa, over 8000 feet, i, 1 ♂ (*Scott*); Mt. Chillálo, Digalla, ca. 9500 feet, 26. xi, 1 ♀ (*Scott*); recorded from Dire Dawa by Stein.

Typical locality: Cape. In the British Museum from: Cape Province, Natal, Transvaal, Southern Rhodesia, Kenya, South-West Arabia.

Musca lasiopa Villen.

Musca lasiopa Villeneuve, 1936, Bull. Ann. Soc. ent. Belg. **76**, p. 414.

Loc. Abyssinia: Jem-Jem Forest, nearly 9000 feet, 24. ix, 1 ♀ (in poor condition) (*Scott*)

Typical locality: forests of Mt. Kenya. In the British Museum is a typical specimen from the type-locality, presented by Dr. Villeneuve.

Stomoxys calcitrans L.

Loc. Abyssinia: Doukam, 6500–7000 feet, 18–20. x, 1 ♂ (*Scott*).

Cosmopolitan.

Stomoxys nigra Macq.

Loc. Abyssinia: between Addis Alam and Jem-Jem, 7000–8000 feet, 20. ix, swept in grass-fields, 2 ♂, 3 ♀;

Jem-Jem Forest, ca. 8000 feet, 23. ix, 1 ♂, 1 ♀ (all *Omer-Cooper*); Addis Ababa, over 8000 feet, 8. ix, 1 ♂ (*Scott*).

Typical locality: Mauritius. In the British Museum from: Mauritius, Seychelles, Southern Rhodesia, Northern Rhodesia, Transvaal, Tanganyika, Nyasaland, Uganda, Kenya, Sudan, Belgian Congo, Cameroons, Nigeria, Gold Coast, Sierra Leone, Gambia.

The two males, respectively from Addis Ababa and Jem-Jem Forest, have the setulose hairs at the base of the hind femora almost as long and erect as in *rodhainica*, but all the other characters, including the dark tibiæ, moderate width of the frons in the male, and abdominal pattern, are those of *nigra*.

Stomoxys varipes Bezzi.

Loc. Abyssinia: Jem-Jem Forest, 8000–9000 feet, 21. ix–1. x, 3 ♂, 2 ♀ (*Scott*); Addis Ababa, over 8000 feet, 8. ix, swept in the field of the Imperial Hôtel, 1 ♂ (*Scott*).

Nyasaland and Southern Rhodesia to Eritrea (R.E., p. 85).

Stomoxys bilineata Grünb.

Loc. Abyssinia: between Addis Alam and Jem-Jem, 7000–8000 feet, 20. ix, 1 ♀ (*Omer-Cooper*).

Typical locality: Tanganyika Territory. In the British Museum: Natal, Zululand, Nyasaland, Southern Rhodesia, Tanganyika and Kenya.

This species and *nigra* are not mentioned by Surcouf and Picard, "Note sur les Diptères du genre *Stomoxys* en Abyssinie" (1908, Bull. Soc. Pathol. éxot. 1, pp. 195–198). On the other hand they list *S. tæniata* Bigot.

XIX.—*Some new Geographical Races of* Leopardus, *commonly known as Ocelots and Margays*. By R. I. Pocock, F.R.S. (Zoological Department, British Museum, Natural History).

Despite the opinion of J. A. Allen, who referred the Ocelots (*pardalis*) and Margays (*wiedii*) to two genera, *Leopardus* and *Margay* respectively (Bull. Amer. Mus. Nat. Hist. xli. p. 354, 1919), on certain cranial differences, I see no reason to change the view I expressed two years earlier that the differences between the two are of specific rather than of generic value (Ann. & Mag. Nat. Hist. (8) xx. p. 344, 1917). They are well marked in extreme cases, to which Allen's knowledge was restricted, but I have nearly complete evidence of intergradation between them. It need only be added that the Cat named *tigrina* by Schreber, as determined by Thomas (Ann. & Mag. Nat. Hist. (7) xii. p. 236, 1903), belongs to another species of Margay, which Allen described as *Oncilla pardinoides.* This I pointed out in the paper cited above. In my opinion *tigrina* represents a third species of *Leopardus*, the name superseding *pardinoides* by its date.

Leopardus pardalis steinbachi, subsp. n.

Locality and history of the type.—Buenavista, Santa Cruz, Bolivia (Steinbach, no. 28.2.9.15). An adult ♂.

Distribution.—The same as the locality of the type and probably elsewhere in Bolivia.

Typically a richly tinted race of Ocelot distinguished from the other South American races by the narrowness of the pattern, which is subordinate to the pale interspaces, and on the average at least by the large amount of white on the sides of the proximal half of the tail. The skull is large, strongly moulded muscularly, but has the proximal half of the nasals exceptionally narrow and compressed.

The type is rich darkish, rusty ochreous above and within the lateral bands, passing into buffy greyish on the flanks; the tail above is like the back, its black pattern being dominant only at its distal end; the fore leg is buff, the hind leg paler and greyer; the pattern on the nape and back consists of thin stripes and spots, on the flanks of thin-rimmed, often imperfect rosettes, lineally arranged, here and there forming complete bands. An adult ♀, topotype (no. 34.9.2.34) has the pattern like that of the type, but the tint is a little brighter and the upper side of the tail has the ground tint fainter and less extensive and the sides are whiter. Another topotype, an adult ♂, has the body-pattern and the tail as in the ♀; but the general ground tint is duller than in either of the two preceding specimens, closely matching the richest tinted skin of *brasiliensis* I have seen. An adult ♂ from the

Sara Province, Central Bolivia (Steinbach, no. 07.8.2.14), is still duller and has the lateral rosettes rounder, but the tail is defectively coloured above, as in three of the specimens from Santa Cruz. This specimen links *steinbachi* with *brasiliensis*. The flesh-measurements, in English inches, of the type are: head and body 31⅛; tail 14⅛; hind-foot 5⅛.

The adult but not old skull of the type, with a condylobasal length of 136 mm., is about the same size as in ♂♂ of *brasiliensis*, and the dorsal profile is lightly and evenly convex as in that race, but the sagittal crest is higher than in older specimens of it, the bullæ are considerably larger and the nasals are much narrower posteriorly, only 4½ mm. wide at the frontal points instead of from 8–10 mm. The skull of an adult ♀, with a condylobasal length of 127 mm., is smaller in all respects than the ♂ skull, except in the posorbital width of 29 mm. in which it resembles the ♂; the sagittal crest is complete but low, the nasals are 5 mm. wide at the frontal points and the bullæ are 25 by 17 mm. The three teeth pm^4, c^1 and m_1 in the ♂ and ♀, those of the ♀ being in brackets, are as follows:—16 (15), 10 (8), 11 (10).

Leopardus wiedii pardictis, subsp. n.

Locality and history of the type:—San Laurenço, Pernambuco, 28 to 60 m. alt. Immature ♂ (Robert, no. 3.10.1.20.

Distribution.—Same as for the type, the only known specimen.

Distinguished from the other races of *wiedii* by its very pale colour, paler than the palest examples of typical *wiedii* from S.E. Brazil, between 20° and 30° S. lat., Paraguay and north-eastern Argentine, and similarly from *L. w. vigens* from the Amazon valley, and by the pattern consisting on the flanks of numerous small rosettes, of which at most a few coalesce to form short bands.

The hair on the nape is not reversed but nearly erect, about 14 mm. long, and just in front of the shoulders forms a pair of radiating whorls. The coat on the back in August is about 18 mm. Ground-colour of the head, nape and shoulders buff, of the mid-line of the back pale, dull, greyish sandy, passing into greyish white on the flanks and clean white below; the fore legs are faintly sandy grey, the hind legs nearly white ; the pattern on the back consists mainly of black spots, on the shoulders of a few short stripes, the stripes of the nape and head being normal ; the numerous small rosettes on the flanks have black, interrupted rims, with dull sandy-buff centres, and stand out boldly against the greyish white ground-colour ; on the basal half of the tail the interspaces are coloured like the back and about as wide as the black stripes, but on its distal half they become gradually white and form very narrow bands between the broad, black stripes.

The flesh-measurements in English inches are : head and body 17⅜ ; tail 9⅜ ; hind foot 4⅛ ; ear 2.

The only external character showing that this specimen belongs to *L. wiedii* is the presence of the two whorls on the nape ; but the size of the skull, which is so young that its milk-teeth are all in place, none of the permanent set even erupting, proves conclusively that it belongs to that species and not to the smaller *L. tigrinus* (=*pardinoides*). The condylobasal length is 84 mm., the cranial width 45 mm., both dimensions slightly exceeding those of adult examples of the last-named species. The skull, when mature, would no doubt have reached the size of the other subspecies of *wiedii* ; and pm^4, extracted from the maxilla, is 11 mm., about the average length for that species.

The generally pallid colour of this Margay, recalling that of the small Somaliland Leopard (*Panthera pardus nanopardus*), suggests a dry, rocky habitat, resembling probably that of the related species of *L. tigrinus emiliæ* from Cearà, just north of Pernambuco, also a pale form, described by Thomas (Ann. & Mag. Nat. Hist. (8) xiii. p. 348, 1914).

Leopardus wiedii boliviæ, subsp. n.

Locality and history of the type.—Buenavista, Santa Cruz, Bolivia, 300 m. alt. Adult ♂ collected by J. Steinbach, September 23.

Distribution.—Bolivia and perhaps Matto Grosso, Brazil.

Distinguished from typical *wiedii* by its larger size, shorter coat, finer, more lineate pattern and neither of the two skins matches any of the skins of typical *wiedii* in tint. Similarly distinguished from *L. w. vigens* in the last-two particulars, but less markedly in the size of the skull, although noticeably bigger, on the somewhat scanty evidence, in bodily size. Matching the Andean race *L. w. pirrensis* in dimensions but not in colour or pattern, there being, on the average at least, less dark pigment in the pelage, the tail, for example, having the pale and dark bands about equal in width.

From the type-locality the British Museum has two skins with the same history. The type (no. 26.1.5.4) has the coat short and sleek, 15 and 9 mm. long on the back and nape respectively. The colour above is bright ochreous buff, brighter and lighter than the brightest and lightest of the other races, there being only very faint fuscous speckling in the contour hairs; the pattern on the back, and even on the shoulders, consists of narrow, mostly streaky spots, on the left side of small irregular, separated rosettes, with brownish ochreous centres, and on the right side of narrow, sinuous, black stripes, with some greyish ochreous patches above and below them. The topotype, an ad. ♀ (no. 26.1.12.5) collected at 450 m. alt. in August, has the coat equally short; but the colour is much darker and duller, buffy, almost olivaceous, grey above and creamy low down on the flanks; the dorsal pattern consists of narrow stripes, not so broken up as in the ♂ type, and on the flanks it is more normal, being composed of narrow, sometimes double, black-rimmed bands completely or incompletely enclosing grey-brown areas.

The flesh-measurements in English inches, those of the ♀ being set in brackets, are as follows: – head and body 31⅛ (26); tail 20 (14½); hind foot 4 (3½); ear 1⅞ (1⅜). The ♂ is actually a little longer than any other specimen of the species known to me. Even the much smaller ♀ is larger than most of the other flesh-measured skins.

The skull of the ♂ type has a total and condylobasal length of 102 and 98 mm. respectively. The same dimensions in the ♀ are 98 and 93 mm.; sex for sex they are considerably larger than the skulls of typical *wiedii*, a trifle larger than those of *vigens* and about the same size as those of *pirrensis*. The bulla in the ♂ skull, measuring

23 by 13 mm., is much more inflated than in the ♀, in which it is 19 by 11½ mm. In both ♂ and ♀ *pm*^{4} is 11 mm.

Leopardus wiedii salvinia, subsp. n.

Locality and history of the type.—Vera Paz, Guatemala. Adult ♂, skin and skull (O. Salvin, no. 75.2.27.1).

Distribution.—Guatemala and perhaps British Honduras.

Distinguished from the grey, western Mexican Margay, *L. w. glaucula*, by its much richer colour and from the Margay of Nicaragua by its much smaller skull.

The type has the coat 16 mm. on the back, 9 on the nape. The colour of the back is pale ochreous tawny, the flanks are buff and the pattern on the sides consists mainly of isolated irregular rosettes, with narrowish dark brown rims and dull ochreous centres; on the tail the black pattern is not dominant over the pale interspaces.

The skin of a young specimen from Duenas, Guatemala (O. Salvin, no. 65.8.18.1), has the coat 25 and 14 mm. on the back and neck respectively; the colour of the back is paler ochreous than in the type, and this tint is restricted to the spinal area but becomes more extensive and brighter on the nape; the flanks are whitish, throwing into bold relief the pattern of rosettes which have black rims, ochreous centres and are more or less confluent in bands. Considering the difference between the two skins in the length of the coat, it is possible that the difference in tint is seasonal, but neither skin is dated and no flesh-measurements were taken.

In colour the type seems to resemble tolerably closely a supposed race described by Allen as *Margay glaucula nicaraguæ*, from the Volcan de Chinandego, Nicaragua *.

But the skull of the type of *nicaraguæ*, an adult ♂, has a total length of 107 mm., whereas the type of *salvinia*, also an adult ♂, has that length 95 mm. The teeth of *salvinia* are also smaller, *pm*^{4} and m_1 in both the Guatemala skulls being 11 and 7½ mm. long, whereas *pm*^{4} in the type of *nicaraguæ* is 12½ mm.

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* For reasons to be explained elsewhere I believe *nicaraguæ* to be a synonym of *pirrensis*, an earlier name given by Goldman to a race of Margay from Cana in eastern Panama.

XX.—*New or little-known* Tipulidæ (*Diptera*).—LX. *Neotropical Species.* By Charles P. Alexander, Ph.D., F.R.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A.

At this time I am discussing a series of Tipulidæ from the Department of Junin, Peru, collected by Messrs. Pedro Paprzycki and Felix Woytkowski. Since the localities discussed have yielded an abundance of new and rare insects in many orders, the following general notes supplied by the collectors are provided and will be referred to in subsequent papers based on the same rich materials. All species discussed herewith belong to the single tribe Eriopterini, vastly developed in the Subtropical and Temperate zones of the Andes.

Huacapistana, Province of Tarma. Collected in the valley of the river Tarma, in the vicinity of the locality Huacapistana. The region is of lower hills and the bottom of the valley, some 1100 metres (3600 ft.), and of the higher mountains covered by rain-forest, some 1600 metres (5400 ft.). February to March 1940.—*Felix Woytkowski.*

Huasahuasi, Province of Tarma. Situated in a valley, on the banks of the Andean stream, Huasahuasi ; altitude approximately 2800 metres (9100 ft.). The collection was made within a radius of 10 kilometres of the village, most of the specimens having been taken in dwarf-wooded ravines, often rising to the Puna, " grass-land," which begins at about 3400 metres (11,500 ft.). April 1940.—*Felix Woytkowski.*

Carpata, Province of Tarma. Locality in the deep valley of the rivers Huasahuasi and Cailpa, altitude approximately 2600 metres (8450 ft.). The collecting spot was in an extremely deep ravine, covered in part with the highland dwarf-wood and in part with an exuberant spring vegetation of alpine flora ; the sides of the ravine form huge masses of steep mountains, rising to some 4500 metres (14,625 ft.). May 1940.

This lot, as well as the Huasahuasi material, was collected in the very centre of the highest Cordilleras, in places where the surroundings favoured the existence of crane-flies, that is, where water-bodies and vegetation were to be found. In all these spots I had to fix my camp for some time, hire mules for travelling purposes and live in a tent, far away from the dwelling places of the native Indios. Part of the material was collected in the bush by means of a butterfly net and part at light, during rainy nights, when the Tipulidæ move about.—*Felix Woytkowski.*

Satipo, Province of Jauja. Altitude 800–900 metres (2600–2925 ft.), in the eastern spurs of the Andes on the river Satipo, a tributary of the Ucayali.—*Pedro Paprzycki.*

I express my deep thanks to Messrs. Paprzycki and Woytkowski for their appreciated aid in making known this rich Tipulid fauna.

Sigmatomera (*Austrolimnobia*) *woytkowskiana*, sp. n.

Size large (wing, male, over 19 mm.; antenna over 8 mm.); general coloration yellow to fulvous-yellow; præscutum with three blackened areas; legs orange; wings subhyaline, the prearcular and costal fields more yellow; vein R_{2+3+4} nearly straight to gently arcuated; vein *2nd A* sinuous; abdominal tergites fulvous; male hypopygium with the outer spine of dististyle blackened.

Male.—Length about 25–27 mm.; wing 19·5–22 mm.; antenna about 9–10 mm.

Rostrum yellow; palpi yellow, the outer two segments a little darker. Antennæ with scape yellow; pedicel yellow basally, ringed apically with black; flagellum black; flagellar segments subcylindrical, moderately elongate, a little dilated on basal third but not at all sigmoid; longest verticils a little shorter than the segments; terminal segment small, oval. Head pale yellow; eyes (male) large, reducing the anterior vertex to a linear strip.

Pronotum yellow. Mesonotum yellow, the surface subnitidous; præscutum with three blackened areas, including a median one on cephalic third and transverse lateral areas behind the pseudosutural foveæ; remainder of the usual præscutal stripes and the centres of the scutal lobes slightly more reddish. Pleura yellow, vaguely patterned with more reddish areas. Haltores yellow throughout. Legs orange, the tarsi passing into brown. Wings subhyaline, the prearcular and costal fields more yellow, this colour including the veins; remaining veins brown. Venation: R_{2+3+4} nearly straight to gently arcuated; *m–cu* variable in position, from just before to just beyond the fork of *M* : vein *2nd A* much more sinuous than in *plaumanniana*.

Abdomen elongate; tergites fulvous, the sternites clearer yellow. Male hypopygium with the outer spine of the dististyle blackened, the beak long and slender, pale.

Hab. Peru (Junin).

Holotype, ♂, Huacapistana, Tarma, in highest rain-forest, altitude 5400 ft., March 2, 1940 (*Woytkowski*). *Paratopotype*, ♂, February 25, 1940.

It is peculiarly fitting that this very striking and distinct crane-fly should be dedicated to Mr. Felix Woytkowski, in recognition of his efforts to make known the vast insect fauna of Peru. The species is closest to *Sigmatomera* (*Austrolimnobia*) *plaumanniana* Alexander (south-eastern Brazil), differing conspicuously in the long antennæ and in all details of coloration of the body and legs. The superficial resemblance of the present fly to Ichneumonid Hymenoptera of the genus *Ophion* Fabricius is noteworthy.

Teucholabis (*Teucholabis*) *submunda*, sp. n.

General coloration polished black, the mesonotum conspicuously variegated with yellow on the præscutum, scutum and scutellum; posterior femora yellow, with a blackened subbasal ring; posterior tibiæ obscure yellow, the tips narrowly darkened; posterior basitarsi (male) swollen; wings pale yellow, restrictedly patterned with brown, including the wing-tip and conspicuous washes in the basal cells; *Sc* very short, ending about opposite origin of the strongly arcuated *Rs*; abdomen chiefly black, the incisures pale; male hypopygium with the basistyle produced at apex into a short apiculate spine, the inner margin back from this spine fimbriate; outer dististyle a simple flattened blade that terminates in a short point.

Male.—Length about 6·5 mm.; wing 7 mm.

Female.—Length about 6·5 mm.; wing 6 mm.

Rostrum yellow; palpi black. Antennæ with the scape obscure yellow; pedicel and flagellum black; flagellar segments oval, gradually decreasing in size outwardly. Head polished black; anterior vertex relatively wide.

Pronotum polished yellow. Mesonotum polished black, variegated with yellow, including two major areas, the first on posterior median portion of præscutum, crossing the suture and including the cephalic half of median area of scutum; second area including most of scutellum. Propleura yellow; mesopleura black, rhe meron yellow; a yellowish pruinose area on the pteropleurite above the middle coxæ. Halteres black, the knobs conspicuously light yellow. Legs with the coxæ yellow; trochanters yellow, the posterior pair more darkened; femora black, the bases yellow, on the fore legs including the proximal fourth, on the other legs much more extensive with only the tips narrowly infuscated; posterior femora with a narrow blackened subbasal ring; fore tibiæ and tarsi black; middle and posterior tarsi obscure yellow, the tips narrowly darkened; middle and hind tarsi black; posterior tarsi with basitarsus of male dilated, of female normal. Wings (fig. 1) with the ground-colour pale yellow; a restricted pale brown pattern, including the wing-tip as far basad as outer end of cell *1st* M_2; a narrow band at cord; conspicuous washes in cell *M* and adjoining basal portions of cells *Cu* and *1st A*, with another darkening in outer ends of those same cells; basal portion of cell *Sc* darkened; stigma subcircular, darker brown; veins dark brown, *Sc* and the prearcular veins yellow. In the female, the darkened wing-tip is slightly less extensive and the more basal dark washes less evident; costal fringe short in both sexes. Venation: *Sc* very short, Sc_1 ending opposite origin of *Rs*, Sc_2 some distance from its tip; *Rs* very strongly arcuated; *m-cu* just beyond fork of *M*; vein *2nd A* weakly sinuous.

Abdomen black, the caudal borders and incisures of the segments yellow; sternal pocket (male) very conspicuous. In the female, tergites black; posterior borders of sternites inconspicuously brightened. Male hypophygium (fig. 4) with the apex of basistyle, *b*, produced into a short spine, the mesal margin of the style basad of this point with a fringe of conspicuous yellow setæ. Outer dististyle, ***od***, a flattened blade that bears a short apical point, the margin of style with coarse setæ. Apex of ædeagus, ***a***, produced into a gently-curved black spine.

Hab. Peru (Junin).

Holotype, ♂, Huacapistana, Tarma, altitude 3600–5400 ft., March 4, 1940 (***Woytkowski***). ***Allotopotype***, ♀, **March 3, 1940.**

The most similar described species is *Teucholabis* (*Teucholabis*) *munda* Alexander, likewise from Peru, which has the thorax uniformly black, and with the pattern of the legs and wings distinct.

Figs. 1–6.

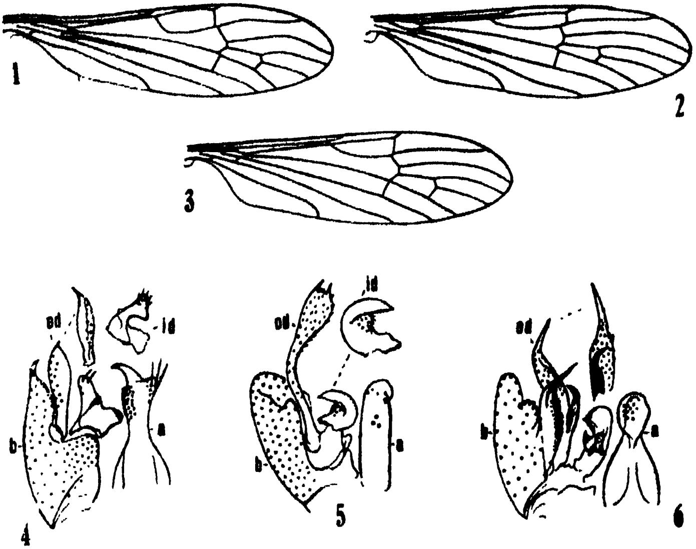


Fig. 1.—*Teucholabis* (*Teucholabis*) *submunda*, sp. n.; venation.
Fig. 2.—*Teucholabis* (*Teucholabis*) *longisetosa*, sp. n.; venation.
Fig. 3.—*Teucholabis* (*Teucholabis*) *brevisetosa*, sp. n.; venation.
Fig. 4.—*Teucholabis* (*Teucholabis*) *submunda*, sp. n.; male hypopygium.
Fig. 5.—*Teucholabis* (*Teucholabis*) *longisetosa*, sp. n.; male hypopygium.
Fig. 6.—*Teucholabis* (*Teucholabis*) *brevisetosa*, sp. n.; male hypopygium.

Symbols: *a*, ædeagus; *b*, basistyle; *id*, inner dististyle; *od*, outer dististyle.

Teucholabis (*Teucholabis*) *longisetosa*, sp. n.

General coloration polished black, the mesonotum variegated with yellow on the scutellum and median region of scutum; knobs of halteres light yellow; legs chiefly black, the middle and hind femora brown, their tips blackened, the bases of the hind femora similarly blackened; wings with a relatively strong and uniform blackish tinge; stigma oval, darker brown; costal fringe (male) long and conspicuous; Sc_1 ending about opposite one-third the length of *Rs*; abdomen, including hypopygium, black; male hypopygium with the basistyle unarmed; outer dististyle long and slender, at apex dilated into a spinous head.

Male.—Length about 5·5–6 mm.; wing 5·6–6·3 mm.

Female.—Length about 5·5 mm.; wing 6 mm.

Rostrum and palpi black, the former short. Antennæ black throughout; flagellar segments oval, decreasing in size outwardly. Head polished black.

Pronotum polished black. Lateral pretergites bright sulphur-yellow. Mesonotum polished black, with conspicuous yellow spots on the cephalic half of the median area of the scutum and the adjoining portion of the præscutum, and on the scutellum. Pleura black, the dorsopleural membrane feebly brightened; ventral posterior sclerites of pleura with a grey pruinosity. Halteres with stem black, knob bright yellow. Legs with the coxæ and trochanters black; fore femora uniformly black; middle femora pale brown on more than basal half, the tips extensively blackened; posterior femora with extreme bases similarly blackened; tibiæ brown, the tips blackened, the fore tibiæ uniformly black; tarsi black; legs unmodified. Wings (fig. 2) with a relatively strong and uniform brownish tinge, the base and broad costal region pale whitish yellow; stigma oval, darker brown; basal portion of cell *Sc* darkened; veins dark brown, the prearcular veins paler. Costal fringe (male) long and conspicuous. Venation: *Sc* of moderate length, Sc_1 ending about opposite or just beyond one-third the length of *Rs*, Sc_2 a short distance from its tip; cell 1*st* M_2 narrow; *m–cu* about one-fourth its length beyond the fork of *M*.

Abdomen, including hypopygium, polished black. Male without a developed sternal pocket. Male hypopygium (fig. 5) with the basistyle, *b*, unarmed with a spine, its apex obtuse. Outer dististyle, *od*, a very long, slender rod, gently curved, at apex dilated into a head that terminates in two slender spines, with numerous additional smaller spines and spinulæ on the head and outer portion of stem. Inner dististyle, *id*, of peculiar conformation, as shown, terminating in an acute point. Apex of ædeagus, *a*, simple, obtuse.

Hab. Peru (Junin).

Holotype, ♂, Huacapistana, Tarma, altitude 3600–5400 ft., February 25, 1940 (*Woytkowski*). *Allotopotype*, ♀, March 2, 1940. *Paratopotype*, ♂, February 18, 1940.

Teucholabis (*Teucholabis*) *longisetosa* is superficially very like *T.* (*T.*) *brevisetosa*, sp. n., but in the structure of the male hypopygium is very different from this and all other species known to me. The apex of the outer dististyle is somewhat as in *T.* (*T.*) *nigrocorporis* Alexander, of south-eastern Brazil, but all other structures, as well as the coloration of the wings, are different.

Teucholabis (*Teucholabis*) *brevisetosa*, sp. n.

General coloration polished black, sparsely patterned with yellow, including the lateral pretergites, median region of scutum, posterior half of scutellum and the dorsopleural region; antennæ black throughout; knobs of halteres light yellow; femora black, the bases obscure yellow, narrowest on fore pair; wings with a very weak brown tinge; stigma triangular, dark brown; costal fringe of male short; *Sc* relatively short, Sc_1 ending about opposite one-fifth the length of *Rs*; *m cu* close to fork of *M*; abdomen, including hypopygium, black; male hypopygium with the spine of basistyle broad-based, along its margin with a dense fringe of setæ; outer dististyle terminating in a slender glabrous spine, on margin at basal fourth with a conspicuous blackened lobe; inner dististyle complex, its apical portion with a major spinous point surrounded by microscopic spinulæ and roughenings.

Male.—Length about 5·5 mm.; wing 5·8 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval, the outer ones smaller and more elongate. Head polished black.

Pronotum polished black, the lateral pretergites light yellow. Mesonotum polished black, variegated with light yellow, including the humeral triangles of the præscutum, the median area of scutum and adjoining portion of præscutum across the suture, and the broad posterior half of scutellum. Pleura polished black, the dorsopleural membrane yellow; a restricted pale area, with grey pruinosity, above the mid-coxæ and on meron. Halteres black, the knobs light yellow. Legs with the coxæ black, the tips obscure yellow; trochanters brownish yellow;

femora black, the bases obscure yellow, narrowest on the fore pair where about the proximal fifth is included, more extensive on the middle and hind femora, on the latter including more than the basal half; tibiæ and tarsi black. Wings (fig. 3) with a very weak brown tinge, the basal portion a little clearer; stigma triangular, relatively small, dark brown; cell *Sc* weakly darkened; veins brownish black, those at base more yellow. Costal fringe (male) short. Venation: *Sc* relatively short, Sc_1 ending about opposite one-fifth the length of *Rs*, Sc_2 before origin of latter; branches of *Rs* parallel to one another for most of their length; cell *1st* M_2 only gently widened at distal end; *m–cu* close to fork of *M*.

Abdomen, including hypopygium, polished black. Male hypopygium (fig. 6) with the apex of basistyle narrow, on mesal face with a broad-based spine that bears a dense fringe of setæ along its margin. Outer dististyle, *od*, terminating in a slender, glabrous spine, the surface with numerous setæ; margin of style on basal fourth with a conspicuous blackened lobe that is narrowed to an acute point. Inner dististyle complex, the apical portion with several small serrulations grouped about one stronger black tooth; more basal spine of style strong and broad-based; lobe on face of style unusually stout.

Hab. Peru (Junin).

Holotype, ♂, Carpapata, Tarma, altitude 2600 metres, May 1, 1940 (*Woytkowski*).

The nearest relative of the present fly is *Teucholabis* (*Teucholabis*) *longisetosa*, sp. n., which, while being almost identical in colouring, has the male hypopygium entirely distinct. The nature of the spine of the basistyle of the present insect is somewhat as in *T.* (*T.*) *leonora* Alexander, of south-eastern Brazil, but all other details are quite different.

Gonomyia (*Progonomyia*) *acanthias*, sp. n.

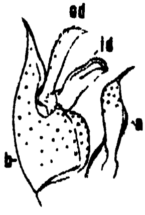
Belongs to the *quinqueplagiata* group; basal flagellar segments weakly bicoloured; legs yellowish brown, the femora not darkened apically; wings with a strong yellow tinge, unpatterned; R_2 at or just beyond mid-length of petiole of cell R_3; abdomen, including male hypopygium, orange, unpatterned; male hypopygium with the basistyle terminating in a long acute spine; apex of ædeagus extended into a delicate spine.

Male.—Length about 4 mm.; wing 4·5 mm.

Rostrum and palpi black. Antennæ with basal two segments yellow, flagellum black, the proximal ends of the five basal segments pale, the remainder uniformly dark; outer flagellar segments elongate, the last shorter than the penultimate. Head obscure yellow.

Mesonotum patterned as in the group, the ground-colour obscure yellow, the præscutum with three polished black areas that represent the anterior ends of the usual stripes; scutal lobes similarly blackened; median area of scutum broadly yellow; posterior border of scutellum yellow; postnotum with most of mediotergite blackened, the cephalic lateral portions and the pleurotergite yellow. Pleura yellow, variegated with darker. Halteres with

Figs. 7–11.



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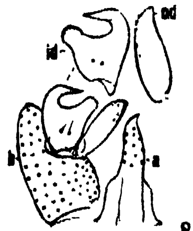

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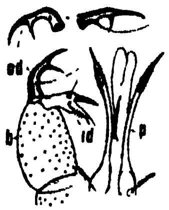

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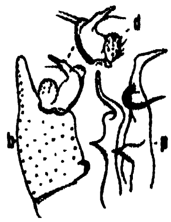

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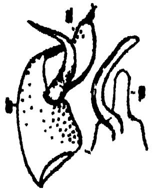

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Fig. 7.—*Gonomyia* (*Progonomyia*) *acanthias*, sp. n.; male hypopygium.
Fig. 8.—*Gonomyia* (*Progonomyia*) *forceps*, sp. n.; male hypopygium.
Fig. 9.—*Gonomyia* (*Gonomyia*) *birama*, sp. n.; male hypopygium.
Fig. 10.—*Gonomyia* (*Gonomyia*) *queribunda*, sp. n.; male hypopygium.
Fig. 11.—*Gonomyia* (*Liphophleps*) *diacanthophora*, sp. n.; male hypopygium.

Symbols: *a*, ædeagus; *b*, basistyle; *d*, dististyle; *id*, inner dististyle; *od*, outer dististyle; *p*, phallosome.

stem yellow, knob dark brown, its apex paling to obscure yellow. Legs with the coxæ yellow, the fore pair darker; trochanters yellow; femora, tibiæ and basitarsi yellowish brown, the tips of the two latter very narrowly darkened; remainder of tarsi black. Wings with a strong yellowish tinge, the prearcular and costal fields clear light yellow; stigma not or scarcely indicated: no darkened pattern on wings; veins obscure yellow, clearer yellow in the brightened portions. Venation: Sc_1 ending a short distance before fork of *Rs*, Sc_2 at near mid-distance between origin of *Rs* and tip of Sc_1; R_2 at or just beyond mid-length of petiole of cell R_3; *m-cu* at fork of *M*.

Abdomen, including hypopygium, orange, unpatterned. Male hypopygium (fig. 7) with the basistyle, *b*, terminating in a long acute spine. Outer dististyle, *od*, relatively long, appearing as a simple blade, the apex cultrate or nearly so, the outer margin with several appressed spinulæ. Inner dististyle, *id*, a stout simple blade. Apex of ædeagus, *a*, produced into a slender spine.

Hab. Peru (Junin).

Holotype, ♂, Satipo, Jauja, altitude 800–900 metres, June 4, 1940 (*Paprzycki*).

The nearest described relative is *Gonomyia* (*Progonomyia*) *bifasciolata* Alexander, which is readily separated from the present fly by the characters given in the following key.

Key to the Species of the quinqueplagiata *group.*

1. **Legs yellow; tips of femora abruptly blackened. (Southern Mexico.)**	*G.* (*P.*) ***atroapicata*** **Alexander.**
Legs uniformly yellow or brown, the femora not darkened at tips	2.
2. **Male hypopygium with the apex of basistyle produced into a strong spine (fig. 7).**	3.
Male hypopygium with the apex of basistyle obtuse, unarmed (fig. 8)	4.
3. **Wings yellowish, with two pale brown cross-bands; abdominal tergites with conspicuous brown areas. (Greater Antilles; Central America.)**	*G.* (*P.*) ***bifasciolata*** **Alexander.**
Wings unpatterned; abdomen uniformly orange. (Peru.)	*G.* (*P.*) ***acanthias*, sp. n.**
4. **Wings without a darkened seam at cord; stigma feebly indicated. (South-eastern Brazil, northern Argentina.)**	*G.* (*P.*) ***quinqueplagiata*** **Alexander.**
Wings with a conspicuous darkened seam at cord, the colour involving the veins; stigma distinct. (Peru.)	*G.* (*P.*) ***forceps*, sp. n.**

Gonomyia (*Progonomyia*) *forceps*, sp. n.

Belongs to the *quinqueplagiata* group; most nearly allied to *quinqueplagiata*; wings brownish yellow, with a distinct brown cross-band along cord, the colour involving the veins; *Sc* long; abdomen orange, without dark markings; male hypopygium with the apex of basistyle unspined; inner dististyle appearing as a broad-based forceps-shaped structure; apex of ædeagus a short acute point.

Male.—Length about 4·5–5 mm.; wing 5–5·5 mm.

Female.—Length about 6 mm.; wing 5·5 mm.

Rostrum and palpi black. Antennæ with scape and pedicel yellow, flagellum black, the extreme proximal ends of the more basal segments yellow, to produce a weak bicoloured appearance; flagellar segments oval to elongate oval and fusiform, the longest verticils exceeding the segments; all segments clothed with a long erect pubescence, additional to the verticils. Head yellow.

Pronotum darkened medially in front, the sides and posterior portions yellow. Pretergites yellow. Mesonotal præscutum light yellow with three conspicuous polished black areas that represent the usual præscutal stripes, these areas paling to more reddish brown behind; scutal lobes extensively polished black; median area of scutum and the scutellum yellow; mediotergite darkened in central portion, the cephalic lateral borders and the pleurotergite yellow. Pleura yellow, with a conspicuous, plumbeous black, longitudinal stripe extending from the propleura to the root of halteres, widest on anepisternum; ventral sternopleurite reddish brown. Halteres brownish black, the extreme base of stem obscure yellow, the apex of knob brighter yellow. Legs with the coxæ yellow, the fore coxæ darker; trochanters yellow; remainder of legs brownish yellow to darker brown, the tibiæ and tarsi still darker. Wings with the ground-colour brownish yellow, the prearcular field and costal border clear yellow; a narrow brown band along cord, extending from the stigma across the wing; a weaker wash along basal half of vein *Cu*, occupying both cells *M* and *Cu*; veins obscure yellow, distinctly darkened in the clouded areas along cord; vein *2nd A* dark; *Cu*, the prearcular field and veins in costal area clear yellow. Venation: *Sc* long, Sc_1 ending shortly before fork of *Rs*, Sc_2 some distance from its tip;

R_2 at one-third the length of petiole of cell R_3; *m–cu* at or before fork of *M*.

Abdomen, including hypopygium, clear orange, without dark pattern. Male hypopygium (fig. 8) with the apex of basistyle, *b*, obtuse, not produced into a spine. Outer dististyle, *od*, a relatively short and wide pale blade, the apex obtuse to subtruncate, the margin microscopically serrulate. Inner dististyle, *id*, broad, produced into two lobes that form a more or less forceps-like structure, the outer arm a strong curved blade that terminates in an acute point, directed toward the inner arm which is obtuse, its margin microscopically serrulate. Apex of ædeagus, *a*, terminating in a short acute to subacute point.

Hab. Peru (Junin).

Holotype, ♂, Satipo, Jauja, altitude 800–900 metres, August 30, 1940 (*Paprzycki*). *Allotopotype*, ♀, with the type. *Paratopotype*, 1 ♂, May 22, 1940.

The relations of the present fly to the other members of the group are shown by the key under the account of the preceding species.

Gonomyia (*Gonomyia*) *birama*, sp. n.

Allied to *quæsita*, general coloration of notum dark greyish brown, the posterior border of scutellum very vaguely paler; legs brownish black; wings with a faint greyish suffusion; *Rs* relatively short, only about two-thirds R_{2+3+4}; male hypopygium with the outer dististyle heavily blackened, at apex split into two divergent spines, inner dististyle terminating in a single blackened spine.

Male.—Length about 3 mm.; wing 3·8 mm.

Rostrum brown; palpi black. Antennæ black throughout; flagellar segments elongate, with long conspicuous verticils. Head dark grey.

Pronotum dark above; lateral pretergites light yellow. Mesonotal præscutum greyish brown, the humeral region obscure yellow; pseudosutural foveæ reddish brown, not conspicuous; posterior sclerites of notum dark brown, only the posterior border of scutellum very vaguely paler. Pleura and pleurotergite chiefly testaceous yellow, vaguely patterned with more reddish brown on anepisternum and sternopleurite. Halteres dusky, the base of stem narrowly pale. Legs with the coxæ obscure yellow; trochanters yellow; remainder of legs brownish black.

Wings with a very faint greyish suffusion; stigmal area a very little darker, diffuse; veins dark brown. Costal fringe of male conspicuous. Venation: Sc_1 ending just before origin of Rs, Sc_2 near its tip; Rs relatively short, less than R_4 and about two-thirds R_{2+3+4}, the latter very long, as in the subgroup; R_3 short and erect; *m–cu* far beyond the fork of M, about opposite mid-length of cell *1st* M_2.

Abdominal tergites dark brown, the sternites somewhat paler; male hypopygium a little brightened. Male hypopygium (fig. 9) with the dististyles apical in position. Outer dististyle, *od*, heavily blackened, split at apex into two unequal spines; stem at near mid-length with a tubercle bearing a very long seta that is subequal in length to the entire style; inner dististyle produced into a slender blackened spine and the usual pale lobe bearing the two fasciculate setæ, this lobe long and narrow. Phallosome, *p*, consisting of two slender rods, gently diverging, their tips narrowed into acute spines.

Hab. Peru (Junin).

Holotype, ♂, Huacapistana, Tarma, altitude 3600–5400 ft., February 11, 1940 (*Woykowski*).

The nearest allies of the present fly are *Gonomyia* (*Gonomyia*) *anduzei* Alexander, of Venezuela, and *G.* (*G.*) *quæsita* Alexander, of southern Mexico. These three flies are readily distinguished from one another by the structure of the male hypopygium, especially of the dististyles.

Gonomyia (*Gonomyia*) *queribunda*, sp. n.

Allied to *chiapasensis*; antennæ black throughout; outer flagellar segments elongate-cylindrical; mesonotum dark brown, the broad scutellum and the median area of scutum yellow; thoracic pleura chiefly yellow, weakly infuscated on the anepisternum and ventral sternopleurite; legs black; wings subhyaline, the diffuse stigmal area a trifle darker; Sc_1 ending opposite origin of Rs; *m–cu* more than one-half its length beyond the fork of M; abdomen dark brown, the hypopygium a little more yellowish; male hypopygium with the outer lobe of basistyle unarmed; apical point of dististyle with two very strong tubercles; elements of phallosome with conspicuous spinous flanges beyond their basal portions.

Male.—Length about 5 mm.; wing 6 mm.

Rostrum obscure brownish yellow, brighter beneath;

palpi black. Antennæ black throughout; flagellar segments oval, beyond the basal two or three passing into elongate-cylindrical, the verticils exceeding the segments. Head dark grey.

Pronotum brown above, variegated with yellow on sides. Mesonotal præscutum dark brown, the pseudosutural foveæ black; lateral pretergites light yellow; posterior sclerites of notum dark brown, the median region of scutum and most of scutellum light yellow; postnotum more pruinose, the cephalic-lateral portion of mediotergite yellow. Pleura yellow, almost unmarked, the anepisternum and ventral sternopleurite a little infuscated; pleurotergite yellow, slightly darkened on dorsal and on ventral margins. Halteres infuscated, the base of stem yellow. Legs with coxæ yellow, the fore and middle pairs a trifle darkened; trochanters obscure yellow; remainder of legs black. Wings sybhyaline, the diffuse stigmal area a trifle darker; veins dark brown, those in prearcular field a little brightened. Venation: Sc_1 ending opposite origin of Rs, Sc_2 close to its tip; cell R_3 large, vein R_4 exceeding R_{2+3+4}; m–cu more than one-half its length beyond the fork of M.

Abdomen dark brown, the hypopygium a little more yellowish. Male hypopygium (fig. 10) with the outer lobe of basistyle, *b*, dusky, shorter than the dististyle, unarmed. Dististyle, *d*, with the blackened apical point bearing two very strong tubercles beyond mid-length. Phallosome, *p*, with conspicuous spinous flanges beyond their bases, these not quite alike on the two structures.

Hab. Peru (Junin).

Holotype, ♂, Huacapistana, Tarma, altitude 3600–5400 ft., March 24, 1940 (*Woytkowski*).

The nearest ally among the described species is *Gonomyia* (*Gonomyia*) *chiapasensis* Alexander, of southern Mexico, which differs chiefly in the structure of the male hypopygium, notably the longer and more slender outer lobe of basistyle, which bears a small but conspicuous flange or lobe near base, the weakly tuberculate apex of the dististyles, and the much poorer development of spinous points or flanges on the two elements of the phallosome.

Gonomyia (*Lipophleps*) *diacanthophora*, sp. n.

Belongs to the *manca* group; thoracic pleura heavily striped with pale yellow on a plumbeous ground; legs black; wings with a strong brownish tinge, the costal and prearcular fields more whitened; *Sc* short; male hypopygium with the basistyle produced beyond the point of insertion of dististyle as a stout lobe that bears two strong spines at apex; dististyle a strong curved spine and a large oval lobe, the latter bearing the fasciculate setæ at tip; phallosome bearing a long flattened sinuous blade.

Male.—Length about 4 mm., wing 4·5 mm.

Head broken.

Anterior lateral pretergites light yellow. Mesonotum dark plumbeous to pruinose, the posterior border of scutellum and the extreme posterior border of each scutal lobe yellow. Pleura plumbeous, with a conspicuous, pale yellow, longitudinal stripe extending from behind the fore coxæ to the abdomen, passing beneath the root of the halteres, the pleurotergite similarly pale; dorsopleural membrane yellow. Halteres pale yellow, the knob very weakly darkened. Legs with the fore coxæ greyish plumbeous, the remaining coxæ yellow, only the extreme base of middle pair dark; trochanters yellow; remainder of legs black. Wings with a strong brown tinge, the prearcular and costal fields more whitened; stigma only a little darker than the ground, ill-defined; veins brown, those in the prearcular and costal portions more brightened. Venation: *Sc* short, Sc_1 ending a distance before origin of *Rs* that is equal to the entire length of the latter vein, Sc_2 near its tip; *m–cu* close to fork of *M*.

Abdominal tergites dark brown; sternites and hypopygium obscure yellow. Male hypopygium (fig. 11) with the apex of basistyle, *b*, produced beyond point of insertion of dististyle as a stout lobe that terminates in two strong spines, their tips acute, the lower spine a little stouter; outer face of basistyle almost without setigerous punctures. Dististyle, *d*, appearing as a strong curved horn-yellow spine, provided with setulæ on basal third, narrowed to an acute tip; on basal portion a second style or lobe, appearing as a large oval lobe with the two usual fasciculate setæ at its apex. Phallosome, *p*, consisting of a quadrate pale basal mass, at apex produced into a stout median lobe; longest arm of phallosome appearing as a long flattened sinuous blade, the apex obtusely cultriform.

Hab. Peru (Junin).

Holotype. ♂, Carpapata, Tarma, altitude 2600 metres, May 13, 1940 (*Woytkowski*).

Gonomyia (*Lipophleps*) *diacanthophora* is entirely distinct from the numerous species of the *manca* group in the Neotropical fauna. As usual, the structure of the male hypopygium provides the best characters. The presence of two spines at the apex of the lobe of the basistyle, the nature of the dististyle, and conformation of the phallosome are quite different from other species.

Erioptera (*Empeda*) *percupida*, sp. n.

Size large (wing, female, over 5 mm.) ; general coloration of thorax yellowish brown, conspicuously patterned with polished black ; pleura with a black longitudinal stripe ; halteres yellow ; legs yellow, the tips of femora, tibiæ and basitarsi blackened ; wings uniform very pale yellow, unpatterned ; veins yellow ; Sc_1 ending about opposite mid-length of *Rs*.

Female.—Length about 5 mm. ; wing 5·5 mm.

Rostrum dark brown ; palpi black. Antennæ relatively short ; basal three or four segments obscure yellow to brownish yellow, the outer segments brownish black ; flagellar segments oval, decreasing in size outwardly, the terminal segment about one-half the penultimate ; verticils of moderate length. Head light grey.

Pronotum light yellow. Mesonotal præscutum light chestnut brown, conspicuously patterned with black, the surface nitidous ; the black areas include nearly the cephalic half of the præscutum,the colour continued caudad as a narrower line to the suture ; sublateral portions of præscutum extensively blackened, the colour crossing the suture onto the outer cephalic portions of the scutal lobes, the remainder of the latter less intensely darkened ; scutellum brownish testaceous, the parascutella black ; postnotum black, sparsely pruinose. Pleura chestnut-brown, conspicuously striped with black on the anepisternum, pteropleurite and pleurotergite ; dorsopleural region pale yellow. Halteres uniformly pale yellow. Legs with the coxæ yellow, the fore pair infuscated on outer face ; trochanters yellow ; femora yellow, the tips abruptly and conspicuously black, most extensive on the fore pair where about the outer third is included, narrowest on the posterior pair where about the distal eighth is involved ; tibiæ and basitarsi yellow, the tips narrowly blackened ;

outer tarsal segments black. Wings uniformly very pale yellow, unpatterned; veins pale yellow, relatively inconspicuous against the ground. Venation: Sc_1 ending about opposite mid-length of *Rs*; R_{2+3+4} about one-fourth longer than R_2; R_3 oblique, a little less than one-third R_4; *m–cu* just before fork of *M*.

Abdomen brown, the central portions of the tergites and the pleural region darker brown; ovipositor with valves darkened basally, paling to horn-yellow outwardly.

Hab. Peru (Junin).

Holotype, ♀, Huacapistana, Tarma, altitude 3600–5400 ft., February 25, 1940 (*Woytkowski*).

Erioptera (*Empeda*) *percupida* is so different from all other described American species that comparison is unnecessary. It much more resembles several species of the subgenus in eastern Asia, especially *E.* (*E.*) *nigroapicalis* Alexander, of Formosa, and *E.* (*E.*) *rata* Alexander, of Mindanao, yet differs in all details of coloration, especially of the body and wings.

Molophilus (*Molophilus*) *gargantua*, sp. n.

Size large (wing 8 mm.); general coloration dark brown; mesonotal præscutum with the ground-colour dark brown, with four paler brown to ochreous-brown stripes; knobs of halteres light yellow; legs brownish black, the femoral bases brightened; wings pale cream-yellow, with two brown cross-bands, the first at level of origin of *Rs*, the second at cord.

Female.—Length about 7·5 mm.; wing 8 mm.

Rostrum dark brown; palpi black. Antennæ pale brown; basal flagellar segments long-oval, the outer segments passing into cylindrical; terminal segment a little longer than the penultimate and slightly bulbous at apex; longest verticils exceeding the segments. Head dark brown, sparsely pruinose.

Pronotum brownish black. Mesonotal præscutum with the ground dark brown, the four usual stripes and the humeral region abruptly light brown to ochreous brown, the intermediate pair of stripes separated by a capillary line of the ground; posterior sclerites of the notum dark brown. Pleura, including dorsopleural membrane, dark brown. Halteres with stem dusky, the base paler, the knob abruptly light yellow. Legs with the coxæ brown;

trochanters brownish yellow; femora brownish yellow at base, passing into dark brown; tibiæ and tarsi brownish black. Wings with the ground-colour pale cream-yellow, brighter yellow in the arcular field; a conspicuous brown pattern, including the extreme base of wing, and two major bands, the first at level of origin of *Rs*, the second at cord; veins brown, paler in the ground areas; macrotrichia dark brown. Venation: R_2 lying just distad of level of *r–m*; petiole of cell M_3 subequal in length to the sinuous *m–cu*; vein *2nd A* sinuous, ending about opposite fork of M_{3+4}.

Abdomen brownish black, sparsely pruinose; ovipositor with valves horn-yellow.

Hab. Peru (Junin).

Holotype, ♀, Huasahuasi, Tarma, altitude 2800 metres, April 9, 1940 (*Woytkowski*).

Molophilus (*Molophilus*) *gargantua* is one of the largest species of the genus in the Neotropical fauna. Among these large-sized forms, such as *M.* (*M.*) *othello*, sp. n., *M.* (*M.*) *luxuriosus* Alexander, *M* (*M.*) *colossus* Alexander and *M.* (*M.*) *titan* Alexander, it differs in the combination of coloration of the mesonotal præscutum, yellow knobs of halteres, and the variegated wings.

Molophilus (*Molophilus*) *othello*, sp. n.

Belongs to the *plagiatus* group; size large (wing, male, 7·5 mm.); general coloration of body, antennæ, halteres and legs intense black; wings with a strong blackish suffusion; male hypopygium with beak of basistyle very stout and compressed; basal dististyle a nearly straight blackened rod that is unequally bispinous at apex.

Male.—Length about 6·5 mm.; wing 7·5 mm.

Female.—Length about 7·5 mm.; wing 9 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval, clothed with a coarse erect pubescence, in addition to the verticils which are nearly twice the length of the segments; outer segments with short apical constrictions; terminal segment a trifle exceeding the penultimate. Head black.

Thorax almost uniform deep velvety-black, the præscutum with slightly more shiny stripes. Halteres black throughout. Legs black. Wings strongly suffused with black, the costal and stigmal portions even darker; veins and trichia black. Venation: R_2 lying a short distance beyond level of *r–m*; petiole of cell M_3 short, only a little exceeding *m–cu*; vein *2nd A* long and sinuous, ending about opposite base of cell M_3.

Abdomen, including hypopygium, black; apices of cerci broadly horn-yellow. Male hypopygium (fig. 12) with

Figs. 12–17.

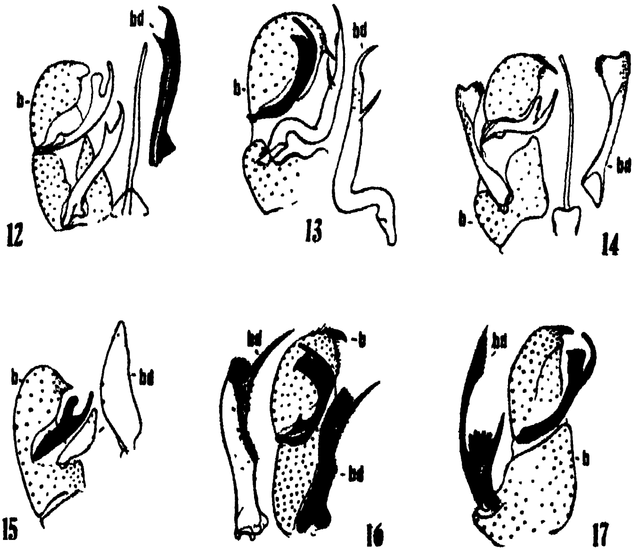

Fig. 12.—*Molophilus* (*Molophilus*) *othello*, sp. n.; male hypopygium.
Fig. 13.—*Molophilus* (*Molophilus*) *persinuosus*, sp. n.; male hypopygium.
Fig. 14.—*Molophilus* (*Molophilus*) *panchrestus*, sp. n.; male hypopygium.
Fig. 15.—*Molophilus* (*Molophilus*) *pala*, sp. n.; male hypopygium.
Fig. 16.—*Molophilus* (*Molophilus*) *grus*, sp. n.; male hypopygium.
Fig. 17.—*Molophilus* (*Molophilus*) *penicillatus*, sp. n.; male hypopygium.

Symbols: *b*, basistyle: *bd*, basal dististyle.

the beak of basistyle very stout and compressed, in lateral outline appearing sub-oval. Outer dististyle, *od*, with the arms unequal, the outer longer and more slender. Basal dististyle, *bd*, a nearly straight blackened rod that is unequally bispinous at apex, the long terminal spine more than three times the length of the subapical one.

Hab. Peru (Junin).

Holotype, ♂, Carpapata, Tarma, altitude 2600 metres, May 12, 1940 (*Woytkowski*). *Allotopotype*, ♀, May 3, 1940.

The present fly is readily told from other large-sized members of the genus by the intense black colour of the entire body and appendages and by the structure of the male hypopygium. It most resembles *Molophilus* (*Molophilus*) *gargantua*, sp. n., which is readily told by the coloration of the body, legs and wings, and by the yellow knobs of the halteres.

Molophilus (*Molophilus*) *persinuosus*, sp. n.

Belongs to the *plagiatus* group; size large (wing, male, over 6 mm.); antennæ (male) elongate, flagellar segments spindle-shaped; general coloration of thorax brownish grey, the median area of præscutum broadly darker brown; halteres obscure yellow; legs black, the femoral bases obscure yellow; wings with the ground-colour yellow, the veins narrowly bordered by darker, the macrotrichia very long; male hypopygium with the basal dististyle a long blackened rod that is very strongly sinuous on basal half, at about two-thirds the length bearing a strong lateral spine.

Male.—Length about 5·5 mm.; wing 6·6 mm.

Rostrum and palpi black. Antennæ black throughout, elongate in male, if bent backward extending about to root of halteres; flagellar segments spindle-shaped, with very long, outspreading verticils, most numerous on the central dilated portion of segment. Head dark brownish grey.

Pronotum dark brown. Mesonotal præscutum brownish grey, the median area broadly darker brown, the surface subnitidous; posterior sclerites of notum brownish black. Pleura brownish black, including the dorsopleural membrane. Halteres obscure yellow throughout. Legs with the coxæ obscure yellow, the fore pair a little darker; trochanters obscure yellow; remainder of legs black, the femoral bases obscure yellow. Wings with the ground-colour yellow, the membrane adjoining the veins more suffused; veins brown, the long macrotrichia dark brown; costal fringe long and dense. Venation; R_2 lying some distance beyond *r–m*; petiole of cell M_3 only a little longer than *m–cu*; vein *2nd A* very long and sinuous, ending opposite base of cell M_3.

Abdomen, including hypopygium, brownish black. Male hypopygium (fig. 13) with the beak of basistyle slender. Outer dististyle with the arms unequal, the inner stout. Basal dististyle, *bd*, a long blackened rod, stout and very strongly sinuous on basal half, the outer half nearly straight and gradually narrowed, terminating in a slender, gently curved spine; at base of spine on outer margin with a low group of roughened tubercles; at near two-thirds the length of style bearing a conspicuous slender lateral branch.

Hab. Peru (Junin).

Holotype, ♂, Carpapata, Tarma, altitude 2600 metres, May 12, 1940 (*Woytkowski*).

Molophilus (*Molophilus*) *persinuosus* is closest to *M.* (*M.*) *subfalcatus* Alexander, of Venezuela, *M.* (*M.*) *subtenebricosus* Alexander, of Colombia, and *M.* (*M.*) *tenebricosus* Alexander, of Colombia, differing in the large size and, especially, in the structure of the male hypopygium, notably the peculiar basal dististyle.

Molophilus (*Molophilus*) *panchrestus*, sp. n.

Belongs to the *plagiatus* group; size small (wing, male, 3·5 mm.); general coloration dull brownish black, the præscutum with indications of darker stripes; legs black throughout; wings broad, strongly suffused with black; male hypopygium with the basal dististyle a simple rod, at apex expanded into a triangular head that is strongly emarginate at apex, the lobes set with appressed spinous points and blackened spines.

Male.—Length about 3 mm.; wing 3·5 mm.

Rostrum and palpi black. Antennæ black throughout, relatively short; flagellar segments long-oval, the outer segments shorter; verticils of unusual length, the longest exceeding three times the segments; besides the verticils, the segments are provided with long erect pale setæ, chiefly at mid-length. Head black.

Thorax dull brownish black, the præscutum with indications of four more brownish stripes that are ill-delimited against the ground. Pleura brownish black. Halteres short, the base of stem obscure yellow, the remainder darker, clothed with yellow setæ. Legs black throughout. Wings broad, with a strong blackish tinge; veins and trichia dark. Venation: R_2 lying just beyond level of *r–m*; petiole of cell M_3 a little less than twice *m–cu*; vein *2nd A* long, sinuous, ending about opposite mid-length of petiole of cell M_3.

Abdomen, including hypopygium, black. Male hypopygium (fig. 14) with the spine of basistyle, *b*, long and slender. Outer dististyle with the apical arms unequal in length and thickness, the inner long and slender; outer arm with mesal face microscopically roughened. Basal dististyle, *bd*, a long simple rod, the base a little dilated, the apical third gradually expanded into a triangular head, the apex of which is strongly emarginate, the stem and outer portion of head with microscopic appressed spinulæ, the produced inner lobe of head with a group of short black spines. Phallosomic plate glabrous, its apex very gently emarginate. Ædeagus very long and slender.

Hab. Peru (Junin).

Holotype, ♂, Satipo, Jauja, altitude 800–900 metres, May 1, 1940 (*Paprzycki*).

The most similar species are *Molophilus* (*Molophilus*) *lictor* Alexander, of Colombia, and *M.* (*M.*) *sublictor* Alexander, of Costa Rica, both of which have the male hypopygium of the same general type yet differing in the details, especially of the basal dististyle. The small size and strongly blackened wings furnish additional characters for the determination of the present fly.

Molophilus (*Molophilus*) *pala*, sp. n.

Belongs to the *plagiatus* group; general coloration dull brownish black, unpatterned; antennæ of male of moderate length, the longest flagellar verticils unilaterally distributed; knobs of halteres light yellow; legs brownish black; wings with a pale yellow tinge, unmarked; male hypopygium with the beak of basistyle small, triangular; basal dististyle a simple blade, the length only about four times the greatest width.

Male.—Length about 4·5 mm.; wing 5·5 mm.; antennæ about 1 mm.

Rostrum dark brown; palpi black. Antennæ of moderate length, black throughout; flagellar segments oval, the outer ones a little more elongate; longest verticils unilaterally distributed. Head dark brown.

Pronotum and mesonotum almost uniformly dull brownish black, the præscutum without stripes. Pleura brownish black, including the dorsopleural area. Halteres with stem yellow at base, darkened outwardly, knob light yellow. Legs with coxæ dark brown; trochanters a little paler; remainder of legs brownish black. Wings with a pale yellow tinge; veins pale brown, more yellow at base. Venation: R_2 lying about opposite *r–m*; petiole of cell M_3 less than twice *m–cu*; vein *2nd A* elongate, extending almost to opposite mid-length of petiole of cell M_3.

Abdomen, including hypopygium, dark brown. Male hypopygium (fig. 15) with the beak of basistyle, *b*, small, triangular. Outer dististyle with arms unequal in length and diameter, the inner arm longer and more slender. Basal dististyle, *bd*, a simple blade, shaped much like the *pala* of the Hemipterous family Corixidæ; length only about four times the greatest width which is at near mid-length, thence narrowed to the subacute tip.

Hab. Peru (Junin).

Holotype, ♂, Huasahuasi, Tarma, altitude 2800 metres, April 20, 1940 (*Woytkowski*).

Molophilus (*Molophilus*) *pala* is readily distinguished by the structure of the male hypopygium, notably the basal dististyle, which is unusually small and simple. Among the described species, this organ is most like that of *M.* (*M.*) *debilistylus* Alexander, of south-eastern Brazil, but the other structures are quite distinct.

Molophilus (*Molophilus*) *grus*, sp. n.

Belongs to the *plagiatus* group; general coloration brownish grey; antennæ (male) of moderate length, black throughout; legs brown, the femoral bases a little brightened; wings subhyaline, with a very faint darkening along cord; male hypopygium with the beak of basistyle blackened, decurved at tip; basal dististyle a very conspicuous black rod, the apex suddenly narrowed into a strong black spine suggesting the head of a crane; apex and margin of style with conspicuous spinous points.

Male.—Length about 4–4·5 mm.; wing 5–5·5 mm.

Rostrum and palpi black. Antennæ black throughout, of moderate length; flagellar segments subcylindrical, the longest verticilis exceeding the segments; pubescence of segments short and delicate. Head dark grey.

Pronotum brownish grey. Mesonotal præscutum brownish grey, the median region somewhat clearer brown; pretergites very obscure yellow; posterior sclerites of notum brownish grey, the posterior border of scutellum a trifle brightened. Pleura brownish black. Halteres with stem yellow, knob infuscated. Legs with coxæ testaceous, the fore pair more brownish testaceous; trochanters obscure yellow; remainder of legs brown, the femoral bases somewhat brightened, the tarsi dark brown; fore tibiæ (male) with a slightly darkened subbasal ring. Wings subhyaline, with a very faint and ill-defined darkening along cord: veins pale; macrotrichia dark; veins along cord a trifle darker. Costal fringe long and dense. Venation: R_2 lying just beyond level of *r–m*; petiole of cell M_3 about one-fourth to one-half longer than the sinuous *m–cu*; vein *2nd A* long and sinuous, ending about opposite one-third the length of petiole of cell M_3.

Abdomen, including hypopygium, dark brown. Male hypopygium (fig. 16) with the beak of basistyle, *b*, blackened and strongly decurved at apex. Outer dististyle with stem slender, the arms large and conspicuous, the inner arm very narrow, the short outer arm broad and flattened, its apex truncate. Basal dististyle, *bd*, a very conspicuous black rod, the stem stout, the apex abruptly narrowed and produced into a long slender spinous point; at base of point with a group of long slender spines or spinous setæ, with a further linear row of the same continued basad for more than one-half the total length of style, the more basal spines stouter and paler; besides these spines, the margin of style basad of apical point with a series of three or four strong tubercles.

Hab. Peru (Junin).

Holotype, ♂, Carpapata, Tarma, altitude 2600 metres, May 1, 1940 (*Woytkowski*). *Paratopotypes*, 2 ♂♂, with type; *paratypes*, 1 ♂, Huasahuasi, Tarma, altitude

2800 metres, April 22, 1940; 2 ♂♂, Huacapistana, altitude 3600–5400 ft., February 10–14, 1940.

In the general structure of the male hypopygium, *Molophilus* (*Molophilus*) *grus* suggests species such as *M.* (*M.*) *lictor* Alexander, of Colombia; *M.* (*M.*) *luxuriosus* Alexander, Colombia; *M.* (*M.*) *miraculus* Alexander, Mexico; and *M.* (*M.*) *pennatus* Alexander, Mexico, differing very conspicuously in all details of structure of the male hypopygium.

Molophilus (*Molophilus*) *penicillatus*, sp. n.

Belongs to the *plagiatus* group; general coloration brownish grey; antennæ black throughout; halteres yellow; legs brownish yellow, the tarsi darker; wings yellowish subhyaline, with a conspicuous, pale brown area along cord; male hypopygium with the basal dististyle a stout rod that forks into two unequal slender spines, between the two with a dense brush of setæ; outer arm before apex with a comb of long spinous points.

Male.—Length about 5–5·5 mm.; wing 6–7 mm.

Female.—Length about 6·5–7 mm.; wing 7–8 mm.

Rostrum dark brown; palpi black. Antennæ black throughout; flagellar segments oval to long-oval, the longest verticils unilaterally distributed, a little more than twice the length of the segments; pubescence relatively long but pale. Head brownish grey.

Pronotum brownish grey above, pale yellow on sides; pretergites pale yellow. Mesonotum brownish grey, the humeral region of præscutum restrictedly brightened; pseudosutural foveæ black. Pleura brownish grey. Halteres yellow throughout. Legs with coxæ testaceous yellow; trochanters yellow; femora and tibiæ brownish yellow; tarsi dark brown to brownish black. Wings yellowish subhyaline, with a conspicuous pale brown area extending from the stigma across the cord; veins yellow, a little darker in the clouded area; macrotrichia pale brown. Costal fringe long and dense. Venation: R_2 lying shortly beyond level of *r–m*; *m–cu* subequal to or about one-fourth longer than the weakly sinuous *m–cu*; vein *2nd A* of moderate length, extending about to opposite one-third to one-fourth the length of petiole of cell M_3.

Abdomen dark brown; hypopygium obscure yellow or brownish yellow. Male hypopygium (fig. 17) with the beak of basistyle, *b*, relatively stout, very gently curved. Outer dististyle, *od*, with the arms unequal, the inner long and slender. Basal dististyle, *bd*, a stout rod that forks into two unequal slender arms, the outer long and slender, the inner less than one-half as long; between the two arms with a dense brush or pencil of setæ; outer arm before apex with a comb of long spinous points; inner spine simple.

Hab. Peru (Junin).

Holotype, ♂, Huasahuasi, Tarma, altitude 2800 metres, April 21, 1940 (*Woytkowski*). *Alltopotype*, ♀, pinned with type. *Paratopotypes*, 35 ♂♀, April 7–25, 1940.

Molophilus (*Molophilus*) *penicillatus* is most similar to species such as *M.* (*M.*) *gymnocladus* Alexander, of Chile, differing very conspicuously in the structure of the male hypopygium, especially of the basal dististyle, as the dense axillary brush of setæ.

Molophilus (*Molophilus*) *sicarius partitus*, subsp. n.

Close to the typical form, likewise from Huacapistana, Tarma, differing in details of structure of male hypopygium. Basal dististyle with the outer blade very narrow, not or scarcely expanded at mid-length; spine of outer face smooth or with spinulæ at base only. In the typical form the outer blade is expanded at mid-length, being more than twice as wide as at base; lateral spine with numerous microscopic spinulæ virtually to its apex.

Hab. Peru (Junin).

Holotype, ♂, Huacapistana, Tarma, altitude 3600–5400 ft., March 24, 1940 (*Woytkowski*). *Paratopotypes*, 2 ♂♂, March 7–24, 1940. *Paratypes*, 1 ♂, 1 ♀, Carpapata, Tarma, altitude 2600 metres, June 1–3, 1940 (*Woytkowski*).

XXI.—*Notes on a small Collection of Myriapoda* (*Chilopoda*) *from Cornwall.*

By Corporal H. J. Larwood, R.A.M.C.

Scharff (1912) drew attention to the presence in Cornwall and Ireland of species occurring in Spain and southern France. It was partly in the hope that further examples would be found of this Lusitanean fauna that the present collection was begun. The scope, however, is small, being restricted to one small region in the neighbourhood of Camborne, and to the summer months. In addition, it has only been imperfectly worked out owing to the writer's entry into military service. Nevertheless the two records of *Lithobius pilicornis* subsp. *doriæ* (Pocock), which is a Pyreneen form, will perhaps justify publication.

Ten species were taken, of which nine are new to the Cornish list given in 1851 in Cock's 'Fauna of Falmouth—Myriapoda.' He gives four species only:—*Lithobius forficatus* Leach, *Geophilus* (*Haplophilus*) *subterraneus* Shaw, *Geophilus* (*Scolioplanes*) *acuminatus* Leach, and *Geophilus* (*Necrophlæophagus*) *longicornis* Leach. Of these only *Lithobius forficatus* occurs in the present collection.

A further object was to determine the characteristics of the fauna living beneath the bark of fallen trees. As far as the Chilopods are concerned, however, no conclusions can yet be drawn regarding this problem: the collection is not sufficiently extensive.

Owing to the difficulty of obtaining literature, the nomenclature in Brade-Birks' two papers (1934 and 1939) has been followed. Extensive use has also been made of Brolemann's "Chilopodes" in the 'Faune de France.'

I wish to express my thanks to Rev. S. Graham Brade-Birks for giving me his opinion on two of the species, and to my friend Dr. F. A. Turk, whose interest and industry has been throughout invaluable.

Class CHILOPODA Latreille, 1817.

Order LITHOBIOMORPHA Pocock, 1895.

Family **Lithobiidæ** Newport, 1844.

1. *Lithobius lapidicola* Meinert, 1872.

Lithobius lapidicola Meinert, 1872; Brolemann, 1930.

1 specimen under bark, 5. vi. 40.

The specimen certainly belongs to this species: the characteristic spine is present, but on one side only. Brade-Birks' observation (1933) that the teeth in *L. lapidicola* are lighter in colour than in *L. borealis* is well borne out.

2. *Lithobius borealis* Meinert, 1868.

Lithobius borealis Meinert, 1868; Brolemann, 1930; Brade-Birks, 1933.

1 ♂, 5. vi. 40. Under fallen leaves. Length 10 mm.

There seems to be no reason for doubting that this example belongs to this species. In every character it agrees, apart from slight differences in spinulation, *e. g.*, the ventral armament of P.15 is 0, 1, 3, 3, 1, *i. e.*, there is an extra VmT, while that of P.1 is 0, 0, 0, 3, 1, the spine VpP being absent.*

It would seem that the Cornish example belongs to a southern group, as it agrees with Ribaut's formula for Spanish forms. Brade-Birks' example was the one captured by Bagnall at Ainsdale in Lancashire—a northern form and agreeing closely with Meinert, who gives the ventral armament of P.1 as 0, 0, 1, 1/2, 1, and of P.15—0, 1, 3, 1/2, 1. Hence it seems that this species may be a Lusitanean form (a suggestion with which the discontinuous distribution would be in accordance †) comprising probably two races.

Distribution.—Faroe Islands, Spain, Algeria, Great Britain.

3. *Lithobius pilicornis* subsp. *doriæ* (Pocock). (Figs. 2 *a*-*b*.)

Lithobius doriæ Pocock, 1890.
Lithobius mediterraneus Chalande, 1903.
Lithobius pilicornis subsp. *doriæ* Brolemann, 1930.

1♀, 3. vii. 40. Inside house, Reskadinnick. Length 31 mm.

1♀, May, 1940. Inside house, Redruth. Length 35 mm.

Rev. S. Graham Brade-Birks expressed the opinion that the specimens cannot belong to the subsp. *doriæ*, which has been recorded from the Pyrenees and eastern France, and must be *Lithobius pilicornis pilicornis* Newport, 1844. It is true that the present specimens are greater in length than the continental forms (given as 13–25 mm.) and have a correspondingly increased number of coxal pores (6, 6, 9, 7 in one and 8, 9, 10, 8 in the other). Nevertheless, the features in which it is in accordance with subsp. *doriæ* appear to be of greater importance :

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* Brade-Birks states the spinulation to be :-

P.1 $\frac{0,\ 0,\ 2,\ 1,\ 1,}{0,\ 0,\ 1,\ 3,\ 1.}$ "double claw."

P.14 $\frac{1,\ 0,\ 3,\ 1,\ 1.}{0,\ 1,\ 3,\ 3,\ 1.}$ "apparently double claw."

P.15 $\frac{1,\ 0,\ 3,\ 1,\ 0.}{0,\ 1,\ 3,\ 3,\ 0.}$ "double claw."

The present specimen has a very definite double claw to P.14.

† In discontinuous distribution it is frequently found that the northern "outposts" are to be found only on islands and on mountains.

the lack of prolongations on tergite 9 and the presence of 4+4 teeth on the "coxosternum forcipulaire" instead of 5+5 as in *L. pilicornis pilicornis*. Furthermore, the spinulation is exactly that described for the Pyreneen form with the exception that VaP begins at P.8 and not P.10 as stated.

Distribution.—"Very common in the Pyrenees, where it replaces *L. forficatus*, with which it is found living in the valleys and in the plain of south-east France."

4. *Lithobius forficatus* (Linné, 1758).

Scolopendra forficata Linné, 1758.
Lithobius forficatus Brolemann, 1930.

Common under stones and beneath the bark of felled, rotting trees.

Distribution.—Brolemann says "Trés commun partout sauf dans les montagnes"—which presumably refers only to France. Pocock (Encycl. Brit., Ed. 13) declares that *Lithobius* is almost exclusively northern in range. Sinclair (Camb. Nat. Hist. vol. v. p. 32) records a species of *Lithobius* found in Cyprus as being equally at home in the snow at the top of Mount Troodos as in the heat of the low country at Larnaea. This species is common everywhere in Ireland (N. Foster, "Myriapoda of Ulster," Ann. & Mag. Nat. Hist. 1919).

It may be worth recording that immature examples of *Lithobius forficatus* were taken in May and June (including a stage III larva early in May), yet Sinclair (*loc. cit.*) says that the species breeds in this country from June to August.

Lithobius, sp. (Figs. 1 *a-e*.)

Two specimens from log (pH. 5·5–6·0) overgrown with moss and humus; loose and rotten. 29. v. 40.

As Rev. S. Graham Brade-Birks says, this specimen is unquestionably closely related to *L. forficatus*, and may be an immature specimen, but certain differences may make a brief description and figures desirable. If it is an immature form it would correspond to Brolemann's stage of "maturus junior" (1930, p. 27) in having less antennal segments, less ocelli (but in this case many less, as Brolemann gives 20–24 in 5–8 rows for the adult), and fewer coxal pores (again many less than 5–11 in each "hanche").

Length.—Specimen 1, 6–8 mm.; Specimen 2, 9·3 mm.

Colour.—As *L. forficatus*—reddish brown above, lighter below.

Head slightly longer than broad, with marginal furrow not enlarged in the middle of the caudal margin.

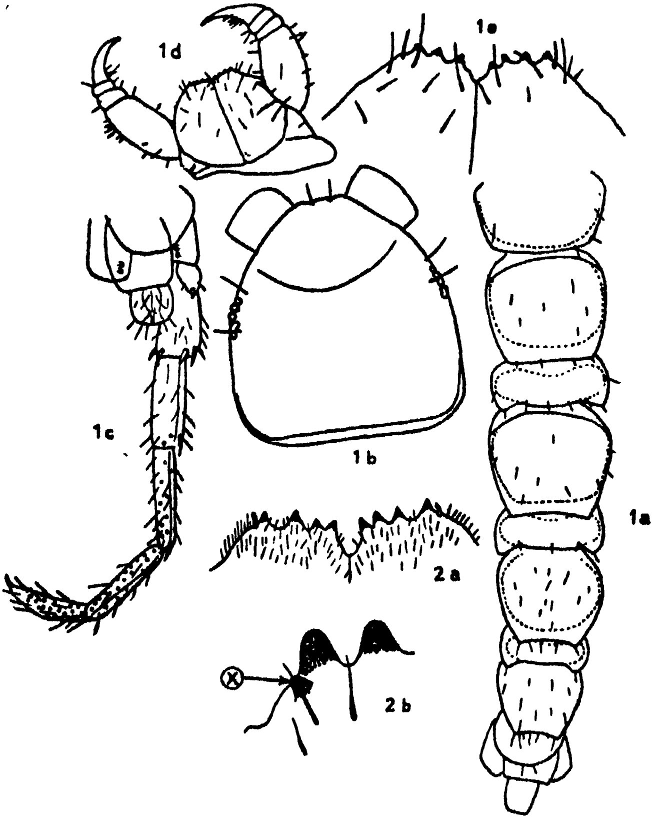

Fig. 1.—*Lithobius* sp. (*a*) Posterior segments and (*b*) head from dorsal aspect; (*c*) P. 15 and (*d*) forcipules in ventral view; (*e*) coxopodite of another specimen.

Fig. 2.—*Lithobius pilicornis* subsp. *doriæ* (Pocock). (*a*) Coxopodite of forcipules with 4+4 teeth; (*b*) the same in another specimen showing ⊗ an incipient 5th tooth on the outer margin of coxopodite.

Ocelli not numerous and not distinct. Dr. Turk has kindly re-examined the specimens in my absence and declares that there are three round eyes on each side, with a larger (twice the size) reniform eye behind, and a little above them—making in all four on each side.

Coxopodite of forcipules with 4+4 teeth (on one specimen there are only three, with an incipient fourth on the inner margin, fig. 1 *e*). There are no additional setæ. Inner margin of claw not crenulate.

Segments 9, 11 and 13 with moderate prolongations which are distinctly broader than long, those of the 11th tergite being the most conspicuous. Posterior margin of segment 8 straight, those of 10, 12 and 16 emarginate.

Coxal pores small, round : 2–3 in each limb.

P.15 with a single claw. Distal part of limb flattened and beset with small pores.

Spinulation :

	H	Tr	Pf	F	T
Ventral.					
P 1	0	0	0	0	m
P.14	0	m	a-p	m	m
P.15	0	m	amp	m	m
Dorsal.					
P.1	0	0	0	0	0
P.14	0	0	a-p	m	0
P.15	0	0	a-p	0	0

(It is possible that in P.15 the spine may be DmP and not DaP.)

5. *Lithobius melanops* Newport, 1845.

Lithobius melanops Newport, 1845 ; Brolemann, 1930.
Lithobius glabratus Koch, 1847.

1 ♀, under bark of tree, orchard of Rosewarne Farm, Camborne. 29. ix. 40.

Distribution.—All France, Europe. This appears to like medium or low altitudes, and has been found many times in these habitats ; on the French seaboard ; by the antarctic expedition and in the caves of the Alpes Maritîmes. This species occurs throughout Ireland (Foster, *loc. cit.*).

6. *Lithobius duboscqui* Brolemann, 1896.

Lithobius (Oligobothrus) duboscqui Brolemann, 1896.
Lithobius duboscqui Brolemann, 1930.

1 ♀. Log, Illogan Woods. 18. vii. 40.

1 specimen. Soil, Treswithian. 21. viii. 40.

This specimen is provided with a double claw on P.15, and cannot be regarded as belonging to Brade-Birks *L. duboscqui* var. *fosteri*.

Distribution.—Whole of France ; does not appear to extend east of the Rhine or the Alps, but extends along the Mediterranean coast as far as San Remo. It is known from the catacombs of Bicêtre and from several grottos in the south of France.

Order GEOPHILOMORPHA Pocock, 1895.

Family **Geophilidæ** (Leach, 1814).

Scolioplanes maritimus (Leach, 1817).

Geophilus maritimus Leach, 1817.
Scolioplanes maritimus Brolemann, 1930.

Three specimens, North Cliffs, Camborne, under stones above high-water mark. 28. vii. 40. Length 15 mm.

Distribution. -All France, Europe, North Africa.

Geophilus carpophagus Leach, 1817.

Geophilus carpophagus Leach 1817 ; Brolemann, 1930.
Necrophlœophagus carpophagus Newport, 1844.
Arthronomalus carpophagus Newport, 1844 (*a*).
Scnipaeus sodalis Bergsoe et Meinert, 1866.
Geophilus condylogaster Latzel, 1880.

1 ♂, under stone, Carn Marth. Redruth. June, 1940.

This agrees with the description in Brolemann, and the arrangement of coxal pores is as in his figures (228) for a British specimen.

Distribution. "All France ; Corsica ; Europe ; North Africa" (a Lusitanean form ?)

Brachygeophilus truncorum (Bergsoe et Meinert, 1866).

Geophilus truncorum Bergsoe et Meinert, 1866.
Brachygeophilus truncorum Brolemann, 1930.

Common under the bark of trees and also found under fallen leaves. May till June, 1940.

The only noteworthy feature of these examples is that the antenna, instead of being three times the length of the head, is almost invariably only twice that length.

Distribution.—"All France ; Great Britain ; Scandinavia ; Central Europe ; Spain ; Asia Minor."

Order SCOLOPENDROMORPHA Pocock, 1895.

Family **Cryptopsidæ** Verhoeff, 1907.

Cryptops hortensis Leach 1813.

Cryptops hortensis Leach, 1813 ; Brolemann, 1930.
Cryptops savignii Leach, 1817.

One specimen under stone, Carn Marth, Redruth. June, 1940.

This specimen lacks the last pair of walking appendages which bear important diagnostic characters. Nevertheless, the remaining features are in such complete agreement with Brolemann's account that I have little hesitation in ascribing it to this species.

Distribution.—" All France, but more or less common in the centre and north ; Great Britain (type) ; Belgium ; Northern Europe."

Foster (*loc. cit.*) says that this species is " probably rare in Ireland," but it occurs in Ulster and in six other county divisions.

Summary.

1. The paper gives the first modern records of Cornish Chilopods.
2. *Lithobius pilicornis* subsp. *doriæ* (Pocock) is recorded for the first time in Britain.
3. A suggestion is made that *Lithobius borealis* Meinert may be a Lusitanean form comprising a southern and a northern race, distinguished by spinulation.
4. A doubtful but interesting form of *Lithobius* is described and discussed.

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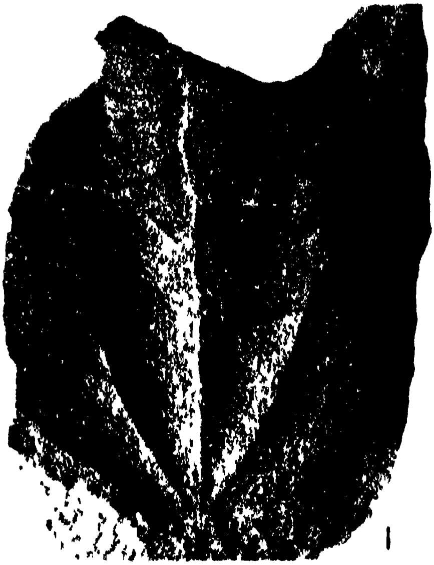
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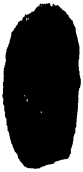
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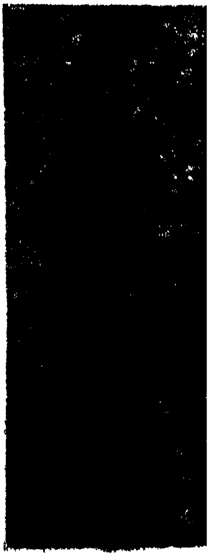

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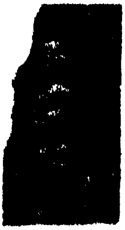


9

Tertiary Plants from East Greenland.

THE
ANNALS AND MAGAZINE
OF
NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 46. OCTOBER 1941.

XXII.—*Systematic Notes on Beetles of the Family* Dynastidæ *and Descriptions of a few new Species.* By Gilbert J. Arrow, F.Z.S., F.R.E.S., British Museum (Natural History).

Oryctes politus Fairm. was unfortunately omitted from my catalogue of this group in Junk's 'Coleopterorum Catalogus,' published in 1937. The species was described in 1901 ('Notes from the Leyden Museum,' vol. xxiii. p. 70) and is Madagascan.

Another omission is *Toxophyllus ganglbaueri* Fairm. (Revue d'Ent. vol. xx. 1901, p. 147), also a Madagascan insect. This was included in the catalogue of Melolonthidæ, the description having, by some curious accident, been placed amongst those relating to species of that family.

Podalgus infantulus Sem. was first recorded from Turkestan but appears to range very widely. I have been unable to separate examples from Algeria, Egypt, Soudan, Somaliland, Central Arabia (Jidda, Nejd, Rub-al-Khali), Bokhara, Punjab, etc. Further evidence must be awaited in order to determine whether it is the same as *P. cuniculus* Burm., the type of which was recorded from Senegambia. The South Arabian form, which I believe to be that called *arabicus* by Fairmaire, although the few characters mentioned as distinctive by him are of little value for its identification, is certainly distinct. It differs from *infantulus* in its generally paler colour and smaller size, its clypeus blunt in front, instead of sharply angular, and bearing a sharp erect tubercle, and by the mandibles, of which the external teeth are rectangular in shape, erect and placed obliquely.

Paranodon excellens, sp. n.

Niger, nitidus, ovatus, convexus, capite rugoso, clypeo antice angusto, bidentato; pronoto parce et minute punctato; elytris grosse seriato-punctatis; pygidio minute inæqualiter punctulato.

Long. 18–20 mm.; lat. max. 11–12 mm.

MADAGASCAR: Diego Suarez.

This is still larger than *P. conicifrons* Fairm., which it appears to resemble, but it is entirely black above and without trace of a tubercle upon the clypeus or marginal impression upon the pronotum in either sex. The clypeus is not truncate in front, but sharply bidentate, and the mandibles are strongly trilobate. The head is rather uniformly rugose, the clypeus separated by a straight carina and its sides straight and convergent. The pronotum is very finely and sparsely punctured, with gently rounded sides, the front angles acute and the hind angles distinct but blunt. The scutellum is blunt and very smooth. The elytra are coarsely punctured in rather irregular rows, the sides rather smooth and the apical margins closely punctured. The pygidium is finely but not closely punctured and smooth at the apex. The front tibiæ are tridentate, the uppermost tooth small. The tarsi are not very short.

The two sexes are alike.

Heteroligus miser, sp. n.

Nigro-fuscus, parum nitidus, corpore subtus breviter haud dense fulvo-hirto; oblongo-ovalis, convexus, capite rugoso, medio impresso, tuberculis duobus remotis armato, clypei margine antico recto; pronoto fortiter et crebre punctato, lateribus rotundatis, angulis posticis nullis, scutello crebre punctato; elytris geminato-striatis, striis et intervallis grosse punctatis; pygidio densissime punctato-rugoso.

Long. 27–29 mm.; lat. max. 15–16 mm.

CAMEROONS : Kongola Kunde, Babua Bondaye (May).

Four specimens formed part of a collection found in the province when it fell into the hands of the victors of the war of 1914–1918.

The species is of narrower shape than most members of the genus and more strongly and roughly punctured, resulting in a less shining upper surface. It is like *H. appius* Burm. in some respects but much larger and without the small double tubercle behind the front margin of the pronotum found in the male of that species. The clypeus is semi-hexagonal, with its front and sides straight, and the frontal carina is broadly interrupted by a median depression and gives rise to a tubercle on each side of it. The pronotum is strongly and closely punctured, with its front angles moderately sharp and the hind angles entirely rounded off. The elytra have three pairs of dorsal striæ which, as well as the broad intervals, are coarsely punctured. The propygidium is broadly transversely striated, but not very finely or regularly, and the pygidium is very finely roughened. The front tibia is quadridentate and the tarsi are rather short. The front claws of the male are a little unequal but not toothed nor cleft and the ædeagus is narrow and tapering.

Trissodon denticeps, sp. n.

Toto rufus, corpore subtus dense fulvo-pubescens; ovalis, convexus, politus, capite toto rugoso, medio recte carinato, ante oculos dentato, clypeo plano, antice modice attenuato, bidentato; pronoto disperse punctato, angulis anticis acutis; elytris irregulariter, intus sparse, extus crebrius et fortius punctatis :

♂, pronoto pone marginem anticum medio tuberculato et lævissime impresso.

Long. 12 mm. ; lat. max. 7 mm.

WEST AUSTRALIA : Pingelly (*N. A. Murray*, April).

A single male specimen.

The numerous species of this genus are most of them remarkable for the extreme smoothness of the upper part of the body, or at least of the pronotum. Few have this part distinctly punctured, although this is the case in *T. australasiæ, terræreginæ, pecuarius* and *puncticollis*, of which the first two have a median tubercle upon the head and the others a simple ridge only. The new species is nearly related to *T. puncticollis* Macl. but considerably smaller. There is a prominent tooth in front of the eye on each side, the clypeus is not distinctly hollowed, the two marginal tubercles are less sharp and farther apart and the pronotum is less strongly punctured. Upon the elytra the punctures are fine and sparse dorsally, stronger and more numerous at the sides and base. The pygidium is smooth, except at the base and sides, where it is strongly punctured. The mandibles are tridentate and the front tibia is broad, with three stout equidistant teeth.

Nephrodopus enigma Sharp.

This appears to be very variable in colouring and *N. thauma* Prell is no doubt the pale phase regarded by Lea as the normal form.

In his tabulation of the males of the genus *Pseudoryctes*, Lea (Trans. R. Soc. S. Austr., 1917, p. 566) appears to have incorrectly identified *P. mullerianus* White, which he characterises as reddish in colour, with a simple anterior thoracic process. The type in the British Museum is black, with the process bifid. It is a broader insect than that figured by Lea. The unfortunately-named *P. bidentifrons* Lea seems to closely resemble the true *P. mullerianus* except for the great breadth of the thorax of the latter and the two teeth which replace the thoracic horn in *P. bidentifrons*.

Pseudoryctes divisus, sp. n.

Læte fulvus, elytris nigris, latus, convexus, pronoto lato, elytris rotundatis, punctatis :

♂, pronoto profunde excavato, longe flavo-ciliato, margine antico medio acuminato, lateribus late elevatis, truncatis.

Long. 15 mm. ; lat. max. 10 mm.

AUSTRALIA.

A single male specimen without exact locality.

This has the small size and peculiar coloration of *P. nigripennis* Lea, but it is of broader form, with stouter legs and more punctured elytra. The head is very smooth, the vertical clypeus small and almost semicircular, the pronotum and scutellum sparingly clothed with long hairs, the elytra very shining but distinctly and rather irregularly punctured. The pygidium is very smooth and shining, with a basal fringe of long hairs. The legs are very stout, the hind tibia as broad at the extremity as it is long. The whole lower surface and the femora are closely clothed with pale tawny hairs. In the male, which, as is usually the case in this group, is the only sex known, the pronotum is about as wide as the elytra at the shoulders, nearly twice as wide as it is long and deeply hollowed, with the sides broadly elevated and obliquely truncated at the summit and the front margin conically raised in the middle, its apex very acute.

I believe *Papuana armicollis* Fairm. to have been incorrectly included among the synonyms of *P. woodlarkiana* in the recent catalogue. It is a smaller species, with distinctly tridentate mandibles, inhabiting Ternate, and *P. uninodis* Prell seems to be a synonym of it.

Papuana japenensis, sp. n.

Nigra, nitida, elongata, modice convexa, tibiis anticis acute tridentatis, dentibus 2 terminalibus connatis, quarto obsoleto; clypeo lato, leviter punctato, margine antico recto, utrinque minute dentato; pronoto polito, margine postico obsolete marginato, angulis posticis rotundatis; elytris geminatim seriato-punctatis, vix striatis, intervallis irregulariter punctatis, lateribus apicibusque subobsolete punctatis:

♂, capite brevissime cornuto, pronoto antice triangulariter excavato, excavatione dense rugulosa, ejus margine postico tuberculato, pronoti angulis anticis rugulosis.

Long. 30 mm.; lat. max. 15 mm.

Japen I.: Mt. Eiori, 2000 ft. (*Miss L. E. Cheesman*, Sept.).

A single male specimen.

This is one of the largest species of the genus. It is a little longer and rather more narrow and depressed than *P. woodlarkiana* Montr. (*semistriata* Arrow), with finer and less deeply impressed punctures than are generally found in the genus. The mandibles are very sharply tridentate, the clypeus rather broad, finely and not closely punctured, with the front margin straight, feebly reflexed and minutely toothed at each end. The pronotum is very smooth, strongly rounded at the sides, the hind angles bluntly rounded and the base feebly trisinuate, with an almost obsolete basal line, and scarcely impressed on each side. The elytra have each a juxta-sutural stria and three double rows of dorsal punctures, with irregularly punctured intervals, the sides and apices finely and feebly punctured.

The male has a short frontal horn, directed backwards, and a sharply defined triangular cavity at the front of the pronotum entirely and finely rugose, the apex of the triangle formed by a very small forward-pointing tubercle. The front angles of the pronotum are also finely rugose. The pygidium is finely rugose at the sides, finely and closely punctured at the base and sparsely at the apex.

Papuana tibialis, sp. n.

Nigra, nitida, elongata, tibia antica haud lata, tridentata, dentibus 2 terminalibus connatis, clypeo parum lato, bidentato, parce et minute punctato, margine antico leviter exciso, dentibus parum remotis; pronoto polito; elytris vix striatis, fortiter seriato-punctatis, marginibus externis grosse et crebre punctatis:

♂, capite medio transverse carinato, carina leviter acuminata, pygidio crebre transversim punctato-rugoso:

♀, pygidio antice dense, postice parce punctato.

Long. 17–20 mm.; lat. max. 8·5–10 mm.

Eastern New Guinea: Kokoda, 1200 ft. (*Miss L. E. Cheesman*, August).

This resembles *P. angusta* Arrow, but is smaller and less elongate. The clypeus is similarly excised in front, the pronotum is very smooth, but the elytra are scarcely striate, the punctures are closer and at the sides and apex much stronger and closer. The terminal part of the front tibia is produced so that its two teeth are separated by a conspicuous interval from the third. The male has a short transverse carina behind the front margin of the pronotum and a smooth area in front of it, and its pygidium is closely covered with punctures and short transverse scratches. That of the female is finely and densely punctured in the anterior half and rather sparsely in the posterior half.

Papuana cheesmanæ, sp. n.

Nigra, nitida, ovata, tibiis anticis brevibus, latis, extus dente minuto quarto armatis; capite pronotoque politis, elytris fortiter punctato-striatis, striis antice et postice haud ad margines attingentibus; clypeo brevi, margine reflexo, fere rotundato, bidentato, dentibus remotis:

♂, capite cornu brevi, reflexo, armato; pronoti medio leviter acuminato parteque antica excavato, excavationis parte antica plagaque laterali rugosis; pygidio nitido, haud dense punctato:

♀, capite medio unituberculato, pronoto pone marginem anticum minute tuberculato, pygidio minute sat dense punctato.

Long. 18–19 mm.; lat. max. 10 mm.

New Hebrides: Tanna (*Miss L. E. Cheesman*, Oct.); Big Bay, Santo I. (*P. A. Buxton*, Aug.).

The resemblance to *P. hubneri* Fairm. is very close, but the present species is distinguished by the rows of strong punctures at the sides of the elytra in both sexes, the relatively narrower elytra, with less rounded shoulders, the rougher surface of the anterior flattened or hollow area of the pronotum in the male and, in the female, by the rudimentary horn or single tubercle upon the head, replacing the two small tubercles found in the same situation in *P. hubneri*. The front margin of the clypeus is not excised, as in the preceding species, but a little rounded, with the two teeth far apart. The mandibles are strongly tridentate externally.

In describing *Dichodontus obesus*, Prell has compared the male with that of *D. grandis*. This was named by Ritsema from a female and its male has not been described. It seems doubtful whether Prell has identified it correctly. It is much the largest known member of the genus and specimens in the British Museum from Borneo and the Malay Peninsula probably belong to it, although Ritsema's type came from Sumatra. The dorsal process in these males reaches a greater length than in any other known species.

It is noteworthy that the two sexes of *Dichodontus* are very different in all but one of the known species. Those of *D. coronatus* are both horned and almost alike. If *D. pulchellus* Prell is actually distinct from *D. coronatus* it will probably also be found to have a horned female.

Dichodontus labuanus, sp. n.

Niger, corpore subtus fusco-rufo, breviter rufo-hirto; ovatus, parum convexus, capite rugoso, clypeo subquadrato;

pronoti lateribus postice rotundatis, antice rectis, convergentibus, angulis anticis productis, posticis fere rectis; elytris lævissimis:

♂, capite cornu brevi, gracili armato; pronoti lateribus late rugosis, medio polito, antice excavato, postice leviter gibboso; pygidio postice nitido, parce punctato.

Long. 32–35 mm.; lat. max. 18–20 mm.

N. Borneo: Labuan I.

The three male examples from which this is described bear a rather close resemblance to females of *D. grandis* Rits., and one of them has been labelled by a former owner as such. They bear a short horn upon the head, however, and not merely a slight tubercle, and the anterior half of the pronotum is more deeply hollowed and in part smooth and shining. The clypeus is narrow, the front margin feebly excised in the middle and the sides gently convergent. It is rather smooth and the rest of the head is rugose. The pronotum is coarsely rugose at the sides and in the posterior part of the cavity. The posterior half is smooth in the middle, forming a slight rounded elevation, as in females of *D. grandis*. The lateral margins are gently rounded behind, straight and convergent in front, with the front angles produced and the hind angles almost rectangular. The scutellum is smooth in the middle and at the margin. The elytra are entirely smooth, with a single juxta-sutural stria, and the pygidium is shining, but with fine scattered punctures. The horn upon the head is not longer, in the three known males, than the head itself, but is slender, pointed and gently curved.

Dichodontus angustus, sp. n.

Niger, nitidus, corpore subtus fusco-rufo, breviter rufo-hirto; angustus, parum convexus, capite rugoso, clypeo angusto, antice leviter angulatim exciso; pronoti lateribus leviter rotundatis, angulis anticis acutis, posticis obtusis, dorso antice cum lateribus grosse rugosis, basi utrinque depresso et rugoso; elytris lævissimis:

♂, capite cornu brevi gracili armato, pronoto antice medio excavato, polito, excavationis margine postico quadridentato, pygidio convexo, dense punctato.

Long. 34–39 mm.; lat. max. 18–20 mm.

Sumatra: Medan; Korinchi Peak, 7300 ft. (*H. C. Robinson* and *C. Boden Kloss*).

The single male specimen, from Medan, is rather small and probably does not show the fullest development in that sex. The distinctive male features are still less developed than in *D. labuanus*. The head-horn is short but slender, the pronotum of similar shape to that of the female, evenly rounded at the sides, with slightly produced front angles, distinct but rather obtuse hind angles. It is feebly convex dorsally, with a small but rather deep anterior excavation, which is smooth and shining, its hinder margin not produced but showing four very small equidistant teeth. The sides are broadly and very coarsely rugose and there is also a fairly large rugose depression on each side of the base. The scutellum is roughly punctured and the elytra are very smooth, with a juxta-sutural stria and some almost obliterated punctures traceable near the outer margins. The pygidium of the male is very convex and finely and closely rugose.

The female has a small sharp tubercle in place of the head-horn and the whole anterior half of the pronotum is rugose, with only a slight trace of the anterior cavity. The two rugose basal impressions are rather smaller than in the male. The pygidium has a strong transverse groove and is very smooth and shining, except at the sides and base.

The British Museum collection contains the specimens from Reiche's collection referred to in his notes on the genus *Megaceras* in the Ann. Soc. Ent. France, 1859 (p. 16). *Megaceras remus* Reiche, recognisable by the absence of a sutural stria upon the elytra, is attributed to Cayenne by Reiche. The female has been named *Megaceras lævipenne* by Prell and recorded as from Peru. It will probably never be possible to establish the identity of *M. philoctetes* Oliv. unless the type-specimen can be traced. The species supposed by Burmeister to be this and re-named *M. ixion* by Reiche appears to be confined to South Brazil. Burmeister mentions a slight tooth near the end of the head-horn, but Reiche says there is no tooth, which is true of his specimen. The tooth is often found in *Megaceras* but inconstant and always feeble. *M. teucer* Burm., considered by Reiche to be the true *philoctetes* Oliv., has been taken at Para and Bahia. *M. septentrionis* Bates, in Central America, has usually rather more reddish elytra than most of its congeners and is also recognisable by its almost completely hairy pygidium.

Pachyoryctes elongatus, sp. n.

Niger, parum nitidus, fere nudus, corpore subtus rufescente; elongatus, fere cylindricus, pedibus parum longis, clypeo antice attenuato, obtuse bidentato, pronoti lateribus antice convergentibus, postice parallelis; scutello ruguloso; elytris parce et minutissime punctatis, stria juxta-scutellari impressis:

♂, capite cornu longo armato, pronoto medio excavato.

Long. 41–46 mm.; lat. max. 21–23 mm.

UPPER BURMA: Nam Tamai Valley (*R. Kaulback*, Aug.); Sumprabum, Putao District (*Mrs. B. Fischer*).

This is a little smaller on the average than the type-species *P. solidus*, and of distinctly narrower form. The colour is more nearly black, the upper surface, as in *P. solidus*, not very glossy, except in the thoracic cavity of the male. This cavity is more sharply defined and narrower, the sides of the pronotum are rather straight and parallel in the posterior half and the hind angles are rather less broadly rounded. The front femur has in both sexes a rather broad and blunt tooth in the middle of the front edge. This is more strongly marked than in *P. solidus*.

The female has a very short rudimentary horn between the eyes, in front of which the head is closely rugose. The anterior part of the pronotum also is closely rugose and the posterior part is punctured.

P. elongatus is the second species of the genus, which at present has been found only in Burma.

Sternberg, in 1904, enumerated and tabulated six species of the genus *Ægopsis*, all of them found in the State of Colombia, with the exception of one in Trinidad (*A. trinidadensis*). Whether it will be possible to maintain all of these when sufficient examples are available for comparison seems rather doubtful. *A. atra* Sternb. and *A. nigricollis* Sternb. appear to me to be probably colour-varieties of the variable *A. curvicornis* Westw. The form here described from Central Peru differs rather conspicuously from those found farther north.

Ægopsis peruvianus, sp. n.

Niger, modice nitidus, corpore subtus piceo, leviter ænescenti, rufo-villoso; capite bene punctato, clypeo sat angusto, rotundato; pronoto medio parce et subtiliter, lateraliter sat fortiter, punctato, angulis anticis lateribusque anguste rugulosis, angulis anticis obtusis; elytris ubique haud regulariter punctatis; pygidio crebre rugoso.

Long. 23 mm.; lat. max. 14·5 mm.

PERU: La Merced, Chanchamayo (*C. O. Schunke*).

I have seen only a single male specimen, received from M. Oberthur. Like all the known males of the genus, it bears a pair of upward-curving horns upon the head and a horizontal dorsal horn upon the thorax, but the latter (although probably not fully developed in the type-specimen, in which it is sharp-pointed instead of blunt at the end) has not the usual downward curvature but points straight forward. The head is not, as usual, very smooth and shining between the horns but closely punctured, and the clypeus is comparatively long and narrow. The pronotum is not entirely rugose in its anterior part, but only in the angles and a narrow lateral border. The outer margins are not angulate but rounded behind, the front angles are not produced and the hind angles are very blunt. The elytra are very short and broad and rather strongly and closely punctured. The pygidium has not the usual very glossy surface but is entirely rugose, finely at the anterior and posterior margins and coarsely elsewhere.

The types of all the species named and described above are to be found in the British Museum collection.

XXIII.—*New Species of* Chrysomelidæ (*Coleoptera*) *from Malaya and Java.* By G. E. BRYANT, F.R.E.S., Entomological Assistant, Imperial Institute of Entomology.

CRYPTOCEPHALINÆ.

Melixanthus milleri, sp. n.

Flavous, the six terminal segments of the antennæ fuscous, the tarsi with the claws black.

Length 3 mm.

Male and female :—Head flavous, flat, the vertex somewhat strongly but not closely punctured, the basal portion almost impunctate and nitid, the labrum and mandibles tinged with fuscous. Antennæ extending to the base of the prothorax, the five basal segments flavous, the six terminal fuscous, the first segment long, the second and third shorter, the fourth and fifth more slender and longer, the six terminal strongly widened and almost equal to each other. Prothorax flavous, widest at the base, the sides feebly rounded and contracted in front, very finely punctured. Scutellum fulvous, the central portion paler, triangular, nitid. Elytra flavous, with the basal margin narrowly pale yellow, widest at the shoulders, thence slightly tapering to the apex, very finely punctate-striate. Legs fulvous, with the claws black. Underside flavous, rugosely punctured, the ventral segments of the abdomen strongly punctured, the first segment almost as long as the three following together, the fifth much longer than the fourth, and in the female strongly notched.

MALAYA: Kuang, 19. xi. 1929 (*N. C. E. Miller*), 1 specimen; Kuala Lumpur, 5. x. 1932, G. 1257 (Entomological Division, Agricultural Department); 1 specimen. Reported feeding on *Melastoma* sp.

Type in the British Museum.

Allied to *M. hians* Suff., but larger and without the pale thoracic markings.

EUMOLPINÆ.

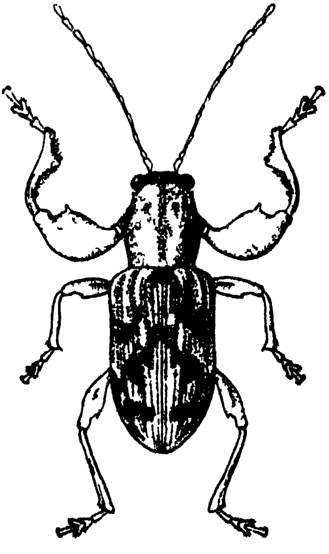
Piomera malayana, sp. n. (Fig. 1.)

Elongate, subcylindrical, fulvous, covered with pale fulvous adpressed scales, prothorax rugose-punctate, elytra deeply and somewhat irregularly punctate-striate, the paler adpressed scales forming an irregular pattern.

Length 5 mm.

Head short, triangular, fulvous, rugosely punctured, the vertex with short adpressed scales, eyes prominent, the antennæ flavous, extending just beyond the middle of the elytra, the two basal segments the shortest and more dilated, segments three to six long and slender, each as long as the two basal together, the five terminal segments each about as long as the sixth, but slightly thickened. Prothorax fulvous, longer than broad, cylindrical, narrowed at the base and apex, rugosely punctured, clothed with pale adpressed scales. Scutellum subquadrate. Elytra much broader than the base of the prothorax, sides parallel. rounded at the apex, surface deeply punctured in irregularly striæ, clothed with dark and pale adpressed scales, forming a distinct pattern, an irregular dark transverse band across the middle, the suture with the apical half broadly margined with pale scales. Legs with the anterior femora greatly swollen and with a strong tooth on the upper margin, clothed with small adpressed scales, the tibiæ strongly incurved, the inner margins serrate, and a large double tooth before the apex, the middle tibiæ slightly incurved, with a tooth at the apex, the hind femora with a small tooth on the underside ; the ventral segments of the abdomen with small adpressed scales and pubescence.

Fig 1



Piomera malayana, sp. n.

Malay Peninsula : Kuala Lumpur, 3. vii. 1932 (*G. H. Corbett*), 1 specimen ; Singapore (*H. N. Ridley*), 1 specimen.

Types in the British Museum.

Allied to *P. brachialis* Baly, from Borneo, but differs in its larger size, the prothorax longer and narrower, the anterior legs more strongly curved and double-toothed.

Nodina malayana, sp. n.

Rounded, convex, æneous, underside black, legs, antennæ and palpi fulvous.

Length 2 mm.

Head æneous, rugosely punctured, the anterior margin of the clypeus emarginate, palpi fulvous. Antennæ short, fulvous, extending to the base of the prothorax, the five terminal segments slightly thickened. Prothorax æneous, transverse, widest at its base, the sides rounded and contracted in front, strongly but not very closely punctured, the punctures closer at the sides. Scutellum subrotundate, impunctate. Elytra æneous, strongly punctate-striate, the punctures not very close together but stronger than on the prothorax. Legs robust, fulvous, the apical half of the tibiæ clothed with fine golden pubescence. Underside black, the ventral segments of the abdomen all about equal; clothed with very short fine pubescence, the male smaller and colour more greenish æneous.

MALAYA: Sardang, 20. ii. 1932; Kuala Lumpur, 30. viii. 1932. Forwarded by G. H. Corbett, and reported as feeding upon *Garcinia mangostana* L., *Rhodomyrtus tomentosus* Wght., and *Cinnamomum zeylanicum* Nees.

Type in the British Museum.

Allied to *N. pusilla* Mots., from India, but the prothorax not so transverse, and the punctures of the elytral striæ not so close.

HALTICINÆ.

Podagrica hibisci, sp. n.

Ovately rounded, fulvous, the elytra metallic blue and the six terminal segments of the antennæ black, elytra with somewhat irregular double rows of punctures.

Length 4 mm.

Head fulvous, impunctate, a triangular impression between the eyes, palpi with the terminal segment acutely pointed. Antennæ extending almost to the middle of the elytra; the five basal segments fulvous, the six terminal black, the basal segment the largest and more dilated than the second, the third more slender and slightly longer than the second, the remainder all about equal to the third, the four terminal slightly thickened and more pubescent. Prothorax fulvous, transverse, very finely punctured, the sides slightly rounded, the basal angles acute, the anterior angles obliquely truncate, the anterior margin with two perpendicular grooves placed behind the eyes. Scutellum fulvous, impunctate, subtriangular. Elytra metallic blue, wider than the base of the prothorax, rounded at the shoulders and tapering to the apex, punctate-striate, with irregular double rows of punctures, their epipleuræ very broad. Legs fulvous, clothed with short fine golden pubescence. Underside fulvous, the ventral segments of the abdomen slightly darker and clothed with fine golden pubescence, the first segment the longest.

MALAYA : Kuala Lumpur, Entomological Division, Agricultural Department, 16. xii 1937 ; 3 specimens. Feeding on *Hibiscus rosa-sinensis* L.

Type in the British Museum.

Allied to *P. chrysomeloides* Jac., from Borneo, but differs chiefly in the puncturation of the elytra, the punctures of the striæ not nearly so close and regular.

Demarchus javanus, sp. n.

Elongate, parallel-sided, colour dirty ivory, the base of the head black, elytra dirty ivory with a transverse basal band obscurely brown and another behind the middle, the margins and suture narrowly brown

Length 4 mm.

Head : the vertex depressed, the basal half black, very rugosely punctured, the front a dirty white with the labrum darker. Antennæ extending slightly beyond the middle of the elytra, of a dirty ivory colour, the first and third segments twice as long as the second, the fourth and remaining terminal segments each a little shorter than the third, more pubescent than the two basal segments. Prothorax transverse, twice as broad as long, of a dirty ivory colour, glabrous, feebly punctured, the sides narrowed near the anterior angles, the posterior angles oblique, a short median transverse depression near the basal margin, and a slight depression near the anterior margin, also depressed at the sides. Scutellum dirty ivory, clothed with short silvery pubescence, triangular.

Elytra parallel-sided, rounded at the apex, slightly broader at the base than the prothorax, clothed with very short silvery pubescence, finely rugose-punctate, a transverse brownish band at the base and another just behind the middle, the margins and suture narrowly brown. Legs a dirty ivory colour, the femora slightly darker, the hind femora incrassate. Underside obscure ivory with the metasternum darker, the ventral segments of the abdomen with short fine pubescence.

JAVA: Buitenzorg, 10. vii. 1929 (*Dr. S. Leefmans*), on *Loranthus* (2 specimens).

Type in the British Museum.

Allied to *D. pubipennis* Jac., from Ceylon, but differs in being more parallel-sided, also colour and pattern different.

XXIV.—*New Species of* Chrysomelidæ (*Coleoptera*) *from Africa*[*]. By G. E. BRYANT, F.R.E.S., Entomological Assistant, Imperial Institute of Entomology.

CRYPTOCEPHALINÆ.

Cryptocephalus ugandæ, sp. n.

Head fulvous, prothorax black with fulvous margins, elytra metallic blue with apical fulvous spot. Legs and basal segments of the antennæ fulvous. Underside with the prosternum and margins of the abdomen fulvous, remainder black.

Length 3–3·5 mm.

Head fulvous, strongly punctured, eyes broadly emarginate. Antennæ extending to the middle of the elytra in the male, the female shorter, the six basal segments fulvous, the five apical black, the first segment about equal to the second and third together. Prothorax black, nitid, with the sides broadly fulvous, very finely punctured, widest at the base, gradually contracted to the anterior margin. Scutellum black, nitid, impunctate, triangular. Elytra metallic blue, with an apical fulvous spot on each, strongly punctate-striate, widest at the base, slightly tapering to the apex and thence rounded. Legs fulvous,

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[*] All the types presented to the British Museum.

the female with the basal two-thirds of the posterior femora black. Underside with the prosternum fulvous, meso- and metasternum black, closely punctured and clothed with very short golden pubescence; the ventral segments of the abdomen black, narrowly margined with fulvous, clothed with very short pubescence, the third and fourth ventral segments short and about equal. Female with the apical segment strongly notched.

UGANDA: Kampala, 22. viii. 1918, 15. ix. 1918 (*C. C. Gowdey*), 2 specimens; 7. vi. 1927 (*H. Hargreaves*), 1 specimen; 20. xi. 1926 (*G. L. R. Hancock*), 1 specimen.

Somewhat allied to *C. callias* Suff., ab. *sheppardi* Jac., as far as colour goes, but differs in being more elongate, the apical spot smaller, and the median portion of the prothorax black.

Cryptocephalus elgonensis, sp. n.

Dark blue or greenish, the male with the tibiæ and tarsi tinged with fulvous, the female entirely black, the prothorax with or without fulvous margins, very finely punctured. Elytra closely punctate-striate. Underside greenish black, clothed with fine silvery pubescence.

Length 3–4 mm.

Head greenish or black, rugosely punctured, the labrum black, nitid, the eyes strongly emarginate. Antennæ black, the male extending beyond the middle of the elytra, female shorter, the segments two to five tinged with fulvous, the second short and rounded, the six terminal segments slightly thickened. Prothorax strongly convex, metallic blue or greenish, with the sides fulvous and the anterior margin narrowly fulvous, very finely punctured; the basal margin finely serrate. Scutellum blue-black, nitid, impunctate. Elytra metallic blue or greenish, widest at the shoulders, slightly tapering to the apex, closely but not strongly punctate-striate. Legs: in the male the tibiæ and tarsi tinged with fulvous, the female entirely black. Underside greenish black, rugosely punctured, clothed with fine silvery pubescence, the female with the apical ventral segment strongly notched.

KENYA: Mount Elgon, 5000–5800 ft., vi. 1911 (*S. A. Neave*), 6 specimens; Kakumga Forest, 4800–5300 ft.,

v. 1911 (*S. A. Neave*), 6 specimens ; Upper Nzoia River, 5100–5400 ft., vi. 1911 (*S. A. Neave*), 2 specimens ; Londiani, iii. 1936 (*H. J. A. Turner*), 1 specimen.

UGANDA : Ankole, Toro Border, 4500 ft., x. 1911 (*S. A. Neave*), 2 specimens ; Lake Matando, 1912 (*Dr. C. H. Marshall*) ; Entebbe, x. 1929 (*Sir G. A. K. Marshall*) ; Fort Portal, x. 1926 (*H. Hargreaves*).

Allied to *C. smaragdulus* F., but differs chiefly in the sculpturing of the prothorax, which is not strongly rugose-punctate.

The female varies slightly in having the prothorax entirely greenish, or the anterior margin may have a slight trace of a fulvous margin.

EUMOLPINÆ.

Liniscus dombeyæ, sp. n.

Head fulvous, with a blue-black patch behind the eyes, prothorax, legs and antennæ fulvous, elytra blue-black, nitid, punctate-striate, mesosternum and abdomen black.

Length 2·5–3 mm.

Of elongate and parallel shape, the head with a few fine punctures on the vertex and a short longitudinal impression between the eyes, fulvous, with a blue-black triangular patch at the base behind each eye, the eyes large and slightly notched. Antennæ long and slender, extending to the middle of the elytra, fulvous, the two basal segments thickened, the second shorter than the first and third, the third and fourth long and slender, the fifth and sixth about equal and each slightly shorter than the fourth, the seventh to the eleventh slightly thickened, tinged with fuscous, and pubescent. Prothorax fulvous, slightly transverse, convex, the sides slightly rounded, sparingly and finely punctured. Scutellum blue-black, nitid, impunctate. Elytra wider at the base than the prothorax, parallel-sided, rounded at the apex ; blue-black, nitid, strongly punctate-striate, the punctures round and close. Legs fulvous, the four posterior tibiæ emarginate at the apex, the femora unarmed. Underside : the prosternum fulvous, the mesosternum and abdomen black.

Pretoria: Hartebeestpoort, 27. xi. 1931 (*J. S. Taylor*), 4 specimens. Reported feeding on *Dombeya rotundiflora.*

Allied to *L. mashonanus* Jac., but much smaller and differing in colour.

HALTICINÆ.

Podagrica maculiceps, sp. n.

Oblong-ovate, head fulvous with a black spot on the vertex, prothorax, legs and basal segments of the antennæ fulvous, elytra blue-black, meso- and metasternum and abdomen black.

Length 4 mm.

Head very finely and sparingly punctured, fulvous, with a black median spot on the vertex, extending to the base, two deep grooves at the base of the antennæ, the latter not quite extending to the middle of the elytra, the five basal segments fulvous, the six apical segments black, the two basal more thickened than the third to the fifth, which are slender and about equal, the six terminal slightly thickened and about equal, the apical segment acuminate. Prothorax fulvous, transverse, very finely punctured, the sides feebly rounded, the posterior angles acute, the anterior angles obliquely truncate, the anterior margin with a short longitudinal groove at each side behind the eyes. Scutellum black, nitid, impunctate. Elytra oblong, rounded at the apex, blue-black, nitid, very finely punctate-striate, in double rows, with very fine punctures in the intervals. Legs fulvous, the hind femora strongly incrassate. Underside with the prosternum fulvous, meso- and metasternum black, impunctate, nitid, the ventral segments of the abdomen black, finely punctured, the first ventral segment equal to the second and third together.

Kenya Colony: Makuyu, i. & ii. 1937 (*C. D. Knight*), 8 specimens; Kabete, iv. 1922 (*H. E. Box*), 1 specimen.

Allied to *P. dalmani* Jac., but differs in the elytra being more parallel-sided, and the black spot on the head.

Superficially very like *Argopus maculiceps* Boh., but distinguished by the two grooves on the prothorax.

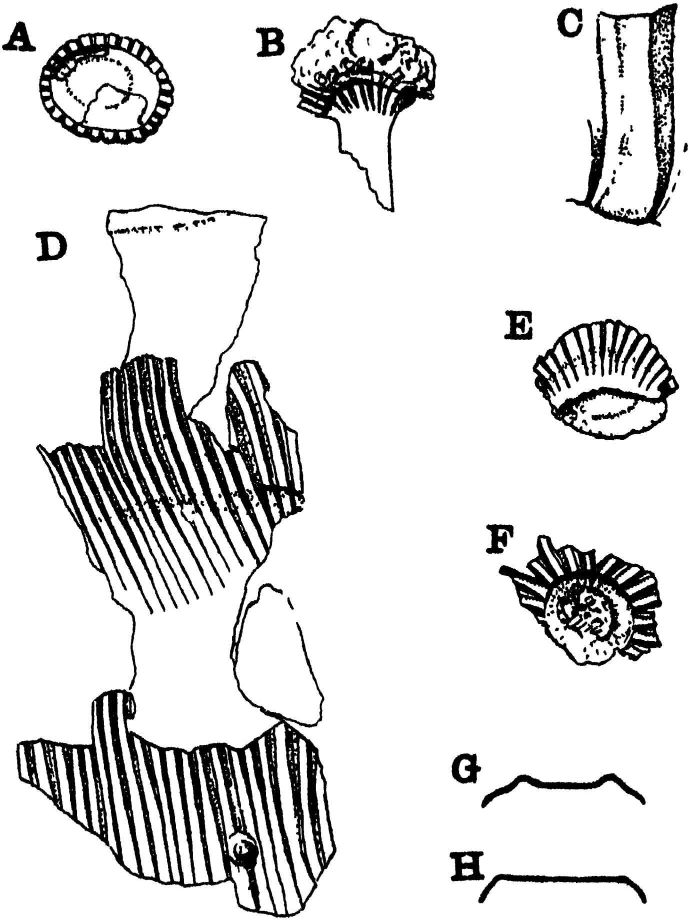
XXV.—*On some Specimens of* Equisetites columnaris Brongn. By TOM M. HARRIS, University of Reading.

EQUISETITES COLUMNARIS is fairly common in the Yorkshire Jurassic flora and has been known over a century, but very little has been learnt about it since 1900 when Seward, in describing numerous specimens, confessed his inability to define the species. In this paper the finer details of some specimens are described with a view to providing facts likely to be of diagnostic value; and certain specimens figured by earlier authors are reinterpreted in the light of more recent additions to our knowledge of the genus *Equisetites*. The present specimens form part of the Wonnacott collection in the Department of Geology of the British Museum, and were collected in 1936 and 1938 in Cayton and Gristhorpe Bays, Yorkshire. Their age is Middle Estuarine (Upper Bajocian), though most of the previously-described specimens of *E. columnaris* are of Lower Estuarine (Lower Bajocian) age.

Macroscopic characters.—The largest specimen (fig. 1 D) is preserved in a sandy shale different from the usual Gristhorpe plant bed matrix. It provides important information about the leaf-sheath, which is of considerable length, though neither its upper edge nor the exact level of its attachment at the node are recognisable with certainty. The surface in the leaf-sheath region consists of alternate raised, flattish leaf-segments and sunken commissures which gradually grow broader above until they exceed the leaf-segments in width. This specimen shows its epidermal sculpture fairly well and yielded the cuticles described below. The form of the raised leaf-sheath segments and depressed commissures in specimens like this is represented diagrammatically in fig. 1 G, H.

The other specimens represent smaller stems, in every case broken off at the level of the node, but part of the internode below is present in some, and in others part of the leaf-sheath above. The node is distinctly swollen; in the small stem shown in fig. 1 B it may be nearly twice as wide as the internode. These specimens provide information about the leaf-sheath; no abrupt change occurs at the level of the node, but the commissural furrows of the leaf-sheath are continued for 4–8 mm.

Fig. 1.



A, oval nodal diaphragm, V 26786, × 1. B, ill-preserved nodal diaphragm and portion of internode below, V 26787 (part and counterpart), × 1. C, segment of leaf-sheath (above node) from specimen shown in F, × 10. D, large stem with two leaf-sheaths, the lower showing a possible branch-scar, the upper an obscure ridge which may represent the nodal diaphragm, V 26785, × 1. E, a nodal diaphragm lying in the horizontal plane partly covered by internodal tissue, V 24734, × 1. F, small nodal diaphragm and part of a leaf-sheath, V 26788, × 2. G, H, diagrammatic sections through the leaf-sheath showing the depressed commissures, G above, H below, the node, × about 20.

before dying away below the node, where both the external and internal surfaces of the compression are free from ridges or other features related to the leaf-sheath segments. The absence of external ridges (due to sclerenchyma ribs) is of some diagnostic value as certain fossils (*E. muensteri*) show them ; the absence of internal ridges is fairly general in *Equisetites*, and has been interpreted as evidence that the water-conducting tissue consists of a compressible carinal canal with little lignified xylem instead of a substantial xylem-strand as in a Calamite (Harris, 1937, p. 7).

There are numerous specimens of nodal diaphragms lying in the bedding plane. The substance of the diaphragm is rather thick and fragile and its surface, which is granular, is often divided into an inner and outer zone by a ring of indistinct tubercles, which appear to be twice as numerous as the leaf-sheath segments and may represent nodal metaxylem masses (Harris, 1937, p. 7). In such specimens the lower part of the leaf-sheath also lies in the bedding plane and the segments radiate separately, the flanges having split apart, as in text-fig. 4 B of Seward, 1900, or remain attached in groups of about three as in text-fig. 1 F. In all the specimens examined the leaf-sheath is broken and the free teeth are absent.

Some of these diaphragms, such as that shown in fig. 1 A, are distinctly oval. There is no reason to doubt that the oval shape is an original feature, although it is very unusual in this genus, but it cannot be used as a diagnostic character because other specimens are almost perfectly circular. Presumably the whole stem providing the oval diaphragms was flattened. It is noteworthy that this collection contains none of the wheel-like diaphragms as figured by Seward (1900, text-figs. 3, 4 C, pl. xix. figs. 4, 5). These diaphragms seem to occur in small stems of the type which has been called *E. laterale* Phillips, which may very possibly be a distinct species.

While no full review of previously-figured specimens is attempted, it may be stated that those described here agree well with the original ones figured by Brongniart (1828, pl. xiii.), as well as with some of those figured by later authors. Among the latter, however, some of those specimens which had lost their leaf-teeth have been figured in an inverted position (compare Seward's fig. 1, pl. xix. (1900), which is correct with fig. 3, which is inverted); this has led to the commissures being mistaken for leaf-teeth, which were accordingly described as linear. No doubt Brongniart's original description of them as short and acuminate is correct.

In Halle's figures (1913) of stems preserved in the position of growth the leaf-sheath seems to be broken off near the node. In other species of fairly similar organisation, such, for example, as *E. scanicus*, *E. prælongus* (see Halle, 1908) and *E. grosphodon* (see Harris, 1931), the commissures are extended as strongly-marked furrows for a few millimetres below the nodes.

Microscopic features.—The compressions shown in fig. 1 show the imprint of the surface cells—both those of the epidermis and of the surface bordering the central cavity. The epidermal cells are represented in fig. 2 F; they are rectangular, form longitudinal rows, and have a more-or-less bulging surface. Over most of the internode there are oval pits which almost certainly represent stomates. These stomates are evenly and fairly thinly scattered; they do not form longitudinal bands, nor are they limited from any regions except near the node, where they become fewer, avoiding the margins of the decurrent leaf-segments and cease to occur at all a few mm. below the node. None have been seen on the leaf-sheath above the node. The specimen shown in fig. 1 D yielded some useful preparations of the cuticle (fig. 2 C). The cell-outlines are scarcely marked, but there are groups of small puckers which seem to represent the bulge of the cell-surface. A few oval stomates were seen: neither the stomates nor other cells are pitted. The decurrent extensions of the commissures yielded a cuticle which is similar, except that the longitudinal cell-walls which here appear to be slightly sinuous are better marked.

The inner surface of the compression is covered with rather large cells with a bulging surface: the hollow imprints of these cells are seen in fig. 2 E. No suggestion was seen of any vascular strands.

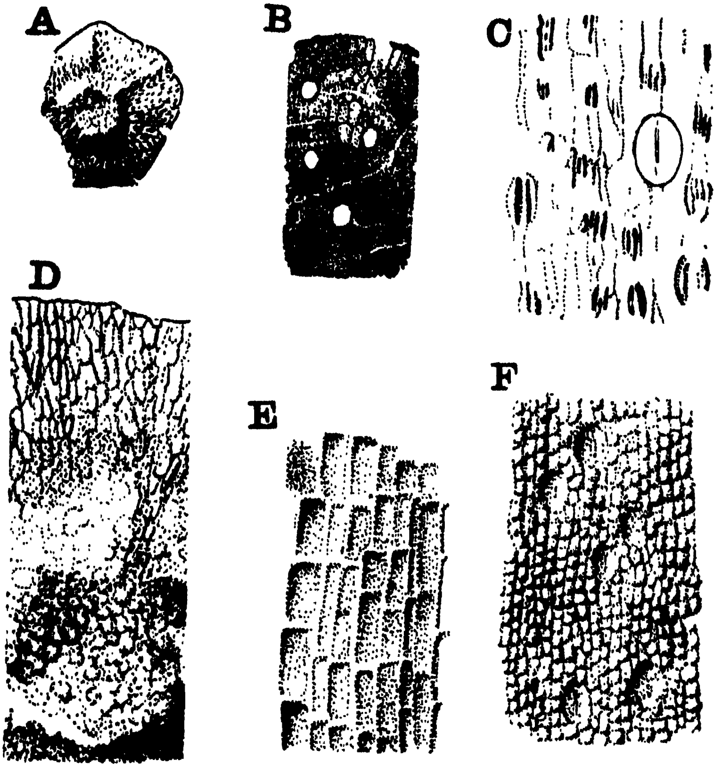
Although the epidermal and cuticular features are known in rather few species of *Equisetites*, they are probably of great diagnostic value. The epidermis of *Equisetum* is remarkably rich in character, showing a rather constant grouping of the stomates; specialised bulging and silicified cells, and pitting or other surface ornamentation, while the boundary wall of the subsidiary and guard-cells is reinforced by lignified bars. Unfortunately, the cuticle only shows part of the epidermal features, and often has the fault that it is thin and scarcely shows the cell-outlines, but even so it gives sufficient information to distinguish many of the species at once.

The epidermis and cuticle described here is different from that of some other species : in the Rhætic *E. lævis* (see Harris, 1931, p. 14) the epidermal cells do not bulge so strongly, the cuticle is thickly covered with round plates, and the stomates are differently shaped ; in the Liasso-Rhætic *E. muensteri* (Harris, 1931, p. 7) the stomates are confined to certain longitudinal strips, cell outlines are better marked, and the surface of the stomates is pitted ; in the Lower Cretaceous *E. lyelli* (of which I have seen undescribed specimens collected by Mr. P. Allen of Reading University), the surface of the epidermal cells is characteristically divided into crinkles rather than a single bulge. There are, however, two Liasso-Rhætic species, *E. sarrani* Zeiller (see Harris, 1931, p. 16, where it is described as *E. doratodon*) and *E. grosphodon* (see Harris, 1931, p. 18), in which the epidermis is similar as far as it is known. Among species where the epidermis is less fully known may be mentioned the Liasso-Rhætic *E. prælongus* and *E. scanicus* (see Halle, 1908), where the leaf-sheath or its decurrent extension is more abundantly provided with stomates than in these specimens of *E. columnaris*.

There seems little likelihood that the cells bordering the pith-cavity provide characters of diagnostic value.

Sporangiophore.—The cone of *E. columnaris* is unknown, but the Wonnacott collection includes two small specimens which appear to be *Equisetites* sporangiophores ; the external surface of the best is shown in fig. 2 A. It is a disc rather indistinctly divided into about six marginal facets and a central concave area. The surface shows rows of bulging epidermal cells, but stomates were not recognised. The other specimen, which was very similar, was made into a balsam transfer ; its substance proved to be very thin, especially near the margins, and its inner surface is smooth. No stalk or sporangia are present, but the margins are bent inwards. The specimen consists of little more than the outer epidermis and shows both cell outlines and stomates clearly by transmitted light except in the middle, where it is thicker and opaque.

Fig. 2.



A, head of sporangiophore, outer surface, V 24701, × 10. B, marginal region of head of sporangiophore, transfer by transmitted light showing stomates, V 24708, × 40. C, cuticle from V 26785 showing a stomate, × 80. D, marginal and central portion of the sporangiophore head, V 24701, × 40. E, imprint in matrix of inner surface of internodal substance from V 26789, × 40. F, outer surface of substance (epidermis) of V 26789, × 40.

These sporangiophore heads were identified generically from their close resemblance to the heads of such fossil species as *E. muensteri* (see Harris, 1931, Halle, 1908, where it is described as *E. suecicus*) and of recent species of *Equisetum*. In *E. arvense*, for example, the outer epidermis of the sporangiophore head is readily separable after rotting from the stalk and underlying tissue as in these specimens. It is identified specifically because this seems to be the only species of the genus present in this locality and because of the agreement in structure between the epidermis of the sporangiophore and the internode.

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XXVI.—*Genus* Chlœbora *Saussure*, 1884 (*Orthoptera*, Acrididæ). By B. P. UVAROV, D.Sc., British Museum (Natural History).

CHLŒBORA Saussure.

1884. *Chlœbora*, Saussure, Prodr. Œdipod. pp. 54, 132.
1888. *Chlœbora*, Saussure, Addit. Prodr. Œdipod. pp. 18, 33.

Saussure established this genus in 1884 for two Indian species, *Ch. grossa* Sauss. and *Ch. bramina* Sauss., which now proved to represent two sexes of the same species (see below). The genus, is, therefore, monotypic, with *Ch. grossa* as its type. Later (1888) Saussure referred to *Chlœbora*, also *Œdipoda crassa* Walker, 1870, which is correct, as well as *Ch. grandidieri* Sauss. from Madagascar. The latter is strikingly distinct from *Chlœbora* and requires a new genus *.

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* **Pycnocrania**, gen. nov. More closely related to *Œdaleus* than to *Chlœbora*. Head very large; frontal ridge widened above ocellus, weakly convex, obliterated near clypeus; vertex convex, medially carinate. Pronotum with the median carina well raised in prozona, deeply incised by the typical sulcus, low but acute in metazona; surface tuberculate; lateral carinæ present, if irregular, near the front margin of prozona; hind angle acute, with concave margins. Elytra

As indicated by Saussure, *Chlœbora* occupies a position intermediate between *Scintharista* and *Pycnodictya* and is not sharply separated from either. Their main differences are those of the degree of specialisation, *Scintharista* having a normal venation of elytra, while in *Pycnodictya* there is a very dense network of veinlets in the proximal portion of the post-discoidal part of elytron, and *Chlœbora* shows the same character weakly expressed. In addition, *Pycnodictya* has a large head and the frontal ridge expanded between antennæ, while *Chlœbora* and *Scintharista* have no such expansion. Thus, *Chlœbora* can be distinguished from *Scintharista* only by its more stout habitus and the somewhat irregular and dense reticulation of the distal portion of the elytra. The difference is, therefore, quantitative rather than absolute, and the difficulty is further increased by the strong dimorphism in the habitus of some *Chlœbora* species, the female of *Ch. grossa*, for example, being a stout insect, very distinct from *Scintharista*, while the male is slender and can be assigned to its proper genus only because of the somewhat specialised venation of the elytra.

Taking the elytral venation as the main generic character, we have to include in *Chlœbora* the following five species :—

1. *Chlœbora crassa* (Walker, 1870).

1870. *Œdipoda crassa* Walker, Cat. Derm. Salt. Brit. Mus. iv. p. 741.
1888. *Chlœbora crassa* Saussure, Addit. Prodr. Œdipod, p. 33.

Baluchistan : Bar Khan, 12. x. 1932, 1 ♂.

Bombay : Nasik, 1900 ft., ix. 1914, 1 ♂, 1 ♀ (*N. B. Kinnear*) ; Poona, 3 ♀♀ ; neighbourhood of Dhupdal and Gokat, Belgaum district, xi. 28, 1 ♂, 2 ♀♀.

Madras : Pattikonda, Kurnool district, 29–30. ix. 1912, 1 ♀.

The main distribution area of this species appears to extend along the Western Ghats, with outlying occurrences in Baluchistan and northern Madras.

The sexes are very similar in the habitus and coloration, differing, of course, in size.

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narrow ; venation similar to that in *Œdaleus*. Hind femur with the upper carina and the upper edge of the externomedian area denticulate ; hind tibia with 9 external spines ; tarsal arolia equal to half the length of claw. Genotype : *Chlœbora grandidieri* Saussure, 1888.

2. *Chlœbora grossa* Saussure, 1884.

1884. *Chlœbora grossa* Saussure, Prodr. Œdipod. p. 132, ♀.
1884. *Chlœbora bramina* Saussure, *l. c.* p, 132, ♂ (*syn. nov.*).
1888. *Chlœbora grossa* Saussure, Addit. Prodr. Œdipod. p. 33.
1932. *Scintharista punjabi* Willemse, Natuurh. Maandbl. v. 21, p. 105, fig. 2, ♀ (*syn. nov.*).

N.W. Frontier Province : Cherat, Peshawar district, 1. v. 1916, 1 ♀ (*Fletcher*).

Punjab : Dhar, 5000 ft., Murree subdiv., 19–30. ix. 28, 4 ♀♀ (*H. S. Pruthi*) ; Simla, 3500–5500 ft., xi.–xii. 25, 1 ♂, 3 ♀♀ ; Simla Hills, 5000–7000 ft., 1926 (*A. E. Jones*) ; Simla Hills, W. Himalayas, 3500-4000 ft., viii.–ix. 25, 1 ♂ (*B. Chopra*).

United Provinces : Kalsi, Dehra Dun district, iv. 1919, 1 ♀ ; Kumaon, v. 1916, 1 ♀.

Bengal : Phoobseing, Lebong, 5000 ft., x. 1910, 1 ♀ (*Partridge*).

Since I have before me a good series of females and two males from Simla, where the species appears to be common, I am able to establish that *Ch. grossa* is strongly dimorphic. The females are much larger and more robust than the males and have beautiful basally violaceous wings with a relatively narrow fascia not, or scarcely, touching the outer margin, while the males are small, slender, with the wings basally light primrose-yellow, bearing a wide fascia touching the margin ; the apex of wing is hyaline in female and infumate in male. This dimorphism was responsible for Saussure's description of the two sexes as two distinct species. Saussure's description of *Ch. grossa* was based on a discoloured female from " Himalaya," and this, as well as the incorrect generic assignment, was the reason for Willemse describing the female sex again as *Scintharista punjabi* from Simla.

The species ranges along the foothills of the Himalayas from the Peshawar to the Darjeeling district.

3. *Chlœbora marshalli* (Henry, 1933).

1902. *Chlæobora grossa* I. Bolivar, Ann. Soc. Ent. France, lxx. p. 604 (*nec* Saussure !).
1933. *Scintharista marshalli* Henry, Ceylon Journ. Sci., B, xvii. p. 166, pl. xxix, figs. 5, 6, 7.

Madras Presidency : Bellary district, Ramandrug, 3500 ft., 31. viii. 1918, 1 ♂, 2 ♀♀ (*Y. R. Rao*) ; Vizagapatum, 1926, 1 ♀ (*H. S. Rao*); Tinnevely district, Dohnavur, 350 ft., 6–7. iv. 1936, 1 ♂, 1 ♀; 29. ix. 1938, 1 ♀ (*G. M. Henry*); Nilgiri Hills, 1 ♀ (*J. C. Fraser*); Adderley, i. 1915, 1 ♀.

BIHAR and ORISSA: Manbhum, 1 ♀ (*K. A. Hallowes*).

CEYLON: Bandarawela, 4000 ft., 1 ♂ (*Henry, l. c.*).

Like *Ch. grossa* of Northern India, this species of the Peninsular India and Ceylon is strongly dimorphic, the male (described by Henry) being yellow-winged and more slender than the female, which is robust and has the basal disc of the wing very pale yellow, sometimes with faint purplish tinge near the base; the wing fascia in the female is absent or very diffuse and narrow, but the veins and veinlets in the portion beyond the disc are brown and the membrane slightly infumate; there is a brown apical spot in the male, but not in the female. *Ch. marshalli* is very closely allied to *Ch. grossa*, but differs from it in the male sex by the more robust habitus and coarsely rugose pronotum, while the female of *Ch. marshalli* is also much more rugose but is relatively more slender than that of *Ch. grossa*, and differs from it also in the coloration of wings. The colour of hind tibia in *Ch marshalli* tends to be carmine-red, instead of the bright red of *Ch. grossa*. The peculiar structure of the pronotal metazona, described by I. Bolivar (*l. c.*) can be observed in most of the females before me, but not in all of them, and not in the males.

There is some variation in the habitus amongst the specimens studied, but it does not appear to have any geographical correlation. A pair of specimens from the Bellary district of Madras differs considerably from the rest in being very robust and short-winged, while the male has no apical wing spot, but I have before me another female from the same locality which is normal in every respect, and this induces me to disregard the pair in question until more material is available.

4. *Chlœbora dimorpha* (Uvarov, 1930).

1930. *Pycnodictya dimorpha* Uvarov, Ann. & Mag. Nat. Hist. ser. 10, vol. vi. p. 178.

Also a strongly dimorphic species, described from British Somaliland.

5. *Chlœbora turkanæ* (Uvarov, 1938).

1938. *Pycnodictya dimorpha* subsp. *turkanæ*, Uvarov, Miss. Scient. de l'Omo, vol. iv. p. 162.

I now believe this to be a good species, not a subspecies of *Ch. dimorpha*. It has been described from the Napau escarpment, Southern Turkana, Kenya.

XXVII.—*Descriptions and Records of Bees.*—CLXXXI.

By T. D. A. Cockerell, University of Colorado.

Halictus spinulosus, sp. n.

♀.—Length about 6·1 mm.

Black, closely related to *H. calviniensis* Ckll., but smaller, with much narrower abdomen; area of metathorax plicatulate basally, apically with a large shining callus, the microscope shows the plicæ to be numerous and strong, their surfaces very finely rugulose or punctulate; head shorter, broader than long; mesonotum with a strong median groove; stigma pale, with a dark margin; hind spur with numerous slender, closely-placed oblique spines, much in the style of *H. politescens* Ckll. or *H. malachurinus* Ckll. (*H. hirtulinus* Ckll. has an entirely different hind spur). As in *H. calviniensis*, the tergites have pallid margins. *H. dispositinus* Ckll. is allied, but smaller, with the margin of the metathoracic area not shining, and the pale margins of first two tergites narrow and inconspicuous.

Cape Province: Calvinia, Nov. 1931 (*Alice Mackie*).

Halictus nitidibasis, sp. n.

♀.—Length about 7 mm., anterior wing about 5.

Robust, black, with thin white hair; flagellum dusky red beneath; head a little longer than broad; clypeus prominent, shining, very coarsely punctured; supraclypeal area very distinctly punctured; an area at each side of base of antennæ shining; front dull, pubescent; mesonotum nearly bare, highly polished, the median groove weak; scutellum polished; postscutellum with dense white tomentum; area of metathorax with fine vermiform rugæ, producing a pitted or subreticulate effect, the marginal region not shining; tegulæ very dark brown. Wings rather short, hyaline; stigma dusky reddish, without an evident dark margin; nervures light brown, the basal nervure dark. Legs black, the hind tibiæ with conspicuous white hair; hind spur with a large obtuse lamella, and a rudimentary one beyond, the same general type as that of *H. macrurops* Ckll. Abdomen rather broad, the basal tergite highly polished; first two tergites without hair-bands, except a little hair at extreme base of second, third and fourth tergites with conspicuous white hair-bands; venter with white hair. The hind femora carry some pale pink pollen.

S. Rhodesia: Christmas Pass, Umtali, May 20–21, 1902 (*Alice Mackie*). There are also two, with the same data, taken by J. Ogilvie, and one of these has the abdomen bent downward, exposing bands of greyish-white tomentum at the bases of the second and third tergites; the first tergite has a patch of pale hair on each side. The third tergite thus has two hair-bands, separated by an interval wider than a band.

Compared with various other Umtali species, *H. nitidibasis* is much larger than *H. umtaliellus* Ckll. and *H. hypochlorinus* Ckll.; much smaller than *H. postplicatus* Ckll., with much darker tegulæ; smaller than *H. bowkeri* Ckll., and with polished mesonotum; quite different in sculpture of metathorax from *H. goniurus* Ckll.; the larger size and polished mesonotum distinguish it from *H. plicatinus* Ckll.; the narrower abdomen, much narrower head and much paler stigma from *H. atelopterus* Ckll.; the colour of the pubescence and the clear wings from *H. levisculptus* Ckll.

Halictus graaffi, sp. n.

♀ (type).—Length about 6 mm.

Black; head broad, front dull, minutely punctulate, clypeus coarsely sculptured; flagellum dusky ferruginous beneath; mesonotum dull, slightly shining on disc; scutellum dull, with two weakly-shining elevations; postscutellum densely covered with pale tomentum; area of metathorax large, its antero-posterior diameter as great as that of scutellum; under a lens the area appears dullish and granular, but the microscope shows the basal part with fine more or less anastomosing plicæ, their surface shining and finely pitted, some of these plicæ continue weakly into the apical portion; tegulæ very dark, with a reddish spot, or a greater amount of red. Wings hyaline, faintly dusky; stigma large, dilute brown, without a dark margin; nervures pale, first recurrent nervure going to basal corner of third cubital cell. Legs black, the tarsi reddish at end; hind spur with two strong oblique spines (style of *H. pericinatus* Ckll.). Abdomen moderately broad, highly polished, with bands of greyish tomentum (not always evident) at bases of second, third and fourth tergites; sides of apical part of abdomen with long white hair. The hair on underside of tarsi is not bright red, as Cameron describes for *H. interstitinervis*. The pollen collected is orange.

♂.—Cheeks with a very long white beard; clypeus with an apical yellow band, its upper side obtusely angulate; antennæ long, reaching scutellum, flagellum red beneath except apically; second cubital cell small, narrowed above (not large and square as in *H. lippani* Cam.); hind basitarsi dull pale yellowish.

Cape Province: Graaff-Reinet, Oct. 24–27, 1931 (*Cockerell*). Also two females and a male with the same date, taken by J. Ogilvie.

Very near to *H. interstitinervis* Cam., but apparently distinct by the characters of the metathorax and darker tegulæ. I saw Cameron's species (from Stellenbosch) in the British Museum.

Another related species is *H. tanganus* Ckll., from which *H. graaffi* is at once distinguished by the highly polished first tergite.

Halictus monodontus, sp. n.

♀.—Length about 8·5 mm.

Black; clypeus shining, with a weak median groove; supraclypeal area shining; front dull; antennæ black, the flagellum very faintly reddish beneath; hair of face thin; mesonotum shining, but not highly polished, very distinctly punctured; scutellum similarly sculptured; area of metathorax appearing dull and granular under a lens, but the microscope shows minute, anastomosing, irregular plicæ, making a fine network all over the surface; pleura with long white hair; postscutellum not conspicuously tomentose; tegulæ large and black, with a more or less evident pale spot. Wings brownish hyaline; stigma dark brown; nervures brown, outer nervures weakened; second cubital cell very broad, receiving first recurrent nervure some distance before end; second recurrent nervure joining third cubital cell a little beyond middle. Legs black; hair on inner side of tarsi pale reddish; hind spur with a single large dentiform lobe on basal part (just as in *H. michaelseni*). Abdominal tergites with rather broad basal bands of pale tomentum, the third and fourth with apical bands.

Cape Province: Oudtshoorn, Oct. 31–Nov. 2, 1931 (*J. Ogilvie*). Two specimens. Very closely allied to *H. michaelseni* Friese, but easily distinguished by the broader head and face, large black tegulæ, dark stigma, and shining, distinctly-punctured mesonotum. It is known from *H. shanganiensis* Ckll. by the smaller size and dark stigma. The head is conspicuously smaller than in *H. deceptus* Smith. The mesonotum is quite different from that of *H. trimeni* Ckll. *H. basizonus* Friese differs by the coarsely plicate area of metathorax.

Halictus pallidipennis Smith.

Cape Province: Calvinia, Nov. 1931 (*J. Ogilvie*).

Halictus lactescens Cockerell.

Cape Province: Doorn River, Nov. 3, 1931 (*L. Ogilvie*).

Halictus tenuilinguis Cockerell.

This is to be placed in the subgenus *Oxyhalictus*, and is very close to *H. matopiensis* Ckll., from S. Rhodesia. In a female from George (*J. Ogilvie*), I note that the marginal cell is narrowly truncate at end, but not appendiculate.

Halictus weenenicus, sp. n.

♀.—Length about 7·4 mm.

Black, robust, with broad abdomen; pubescence scanty, clear white; head broader than long; clypeus convex, very coarsely punctured; front and supraclypeal area dull; vertex not polished, but a shining lunule externally bordering each lateral ocellus; antennæ black, the flagellum faintly brownish beneath; mesonotum dull and granular; scutellum entirely dull, not at all bigibbous; postscutellum with conspicuous white tomentum; area of metathorax semilunar, large, rounded posteriorly, with strong plicæ, giving a rugose effect; posterior truncation not sharply defined; tegulæ black, hairy in front, posteriorly bare and polished. Wings brownish; stigma large, dusky red, nervures dark; first recurrent nervure joining second cubital cell a short distance before end; third cubital cell not much broader than second, receiving second recurrent nervure near beginning of last third. Legs black, the hind femora and tibiæ with conspicuous white hair; hair or inner side of tarsi creamy white; hind spur minutely spinulose (style of *H. deceptus* Smith), the two spurs alike. Abdomen polished, the first tergite strongly so; margins of tergites black; lateral bases of second and third tergites with triangular (cuneiform) patches of white hair; venter with long pure white hair. The microscope shows that the mesonotum has a strong reticulate sculpture.

Natal: Weenen, Feb. 1925 (*H. P. Thomasset*), British Museum. The abdomen resembles that of *H. lactescens* Ckll., but the head and thorax are quite different. The head is much broader and shorter than in *H. placatus* Ckll. The abdomen, area of metathorax and wings resemble those of *H. pachyacanthus* Ckll., but the dull scutellum is quite different.

XXVIII.—*Notes on the Plectognath Fishes.*—VII. *The Aracanidæ, a distinct Family of Ostraciontoid Fishes, with Descriptions of Two new Species.* By A. Fraser-Brunner.

In a previous paper of this series I have given a synopsis of the genera of the family Ostraciontidæ, based upon external characters [*]. A subsequent study of the osteology of this group, however, preparatory to a monograph of the whole Order, has convinced me that the genera which in that synopsis were somewhat scantily separated off as the subfamily Aracaninæ, constitute in fact a distinct family, Aracanidæ.

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[*] Ann. & Mag. Nat. Hist. (10) xvi. p. 313, 1935.

The main features of the skull in this group are closely similar to those of the Ostraciontidæ, and will prove of value in the diagnosis of the suborder Ostraciontoidea if such rank should be accorded these two families. But the following brief synopsis will show the most important of the other skeletal characteristics upon which my decision to separate the families is based :—

I. Precaudal vertebræ 6; caudal vertebræ 10; neural spines on all vertebræ from the 2nd. Hæmal canal straight, in median line of vertebral column. Post-cleithra greatly expanded, forming broad inner shield for abdominal cavity. Anterior interneural bones united to form a supraneural plate, extending back from supraoccipital crest to origin of soft dorsal fin. Last interhæmal not enlarged, in contact with only one hæmal arch .... **Aracanidæ.**

II. Precaudal vertebræ 9 or 10; caudal vertebræ 5 or 6; anterior 4 or 5 vertebræ with neural spines. Hæmal canal diverted either to the right, or alternately to right and left. Post-cleithra comparatively little expanded. Anterior interneural bones reduced to a small plate immediately in front of soft dorsal fin. Last interhæmal enlarged, in contact with 3 hæmal arches .... **Ostraciontidæ.**

I find also that the Ostraciontidæ can be divided into two subfamilies as follows :—

I. Vertebræ 16 (10+6). Neural arches embracing centra and meeting parapophyses to form depressed, forward-directed expansions. Hæmal canal diverted to the right. Dorsal and anal rays 9; pectoral rays 10. Indo-Pacific forms . OSTRACIONTINÆ.

II. Vertebræ 14 (9+5). Neural arches unconnected with parapophyses, which are scarcely developed or obsolete. Hæmal canal diverted alternately right and left. Dorsal and anal rays 10; pectoral rays 12. Atlantic forms .... LACTOPHRYSINÆ.

It will be evident tha [illegible] must be removed from the genus *Rhinesomus*, the type of which is an Atlantic species, and the genus *Tetrosomus* Swainson, 1839, must be recognised to contain them.

The genera of Aracanidæ remain as defined in my previous key.

In addition to these improvements to my earlier paper, I have discovered there in an unfortunate error which it seems expedient to correct here, having as it does an important bearing on the nomenclature of the species of *Anoplocapros.*

In that paper I pointed out that the fish most commonly identified as *Anoplocapros lenticularis* (Richardson) belonged in fact to a distinct genus, which I designated *Strophiurichthys.* At the time I had only three skins which could be associated with the original description of *A. lenticularis*, and assumed that the largest of them was the type. Since then, however, another specimen has come to light which is clearly labelled as the specimen described by Richardson, and is ten inches in total length, the size given by Günther for the type-specimen. I have no doubt, therefore, that this is actually the type of *Anoplocapros lenticularis*, and that the specimens mentioned in my earlier paper were wrongly identified, belonging to a different species, which must be described as new.

Moreover, it is now clear that *Anoplocapros gibbosus* McCulloch & Waite is synonymous with *A. lenticularis* ; but *A. grayi* Kaup must be considered a valid and very distinct form.

The third species of this genus may now be described as follows :—

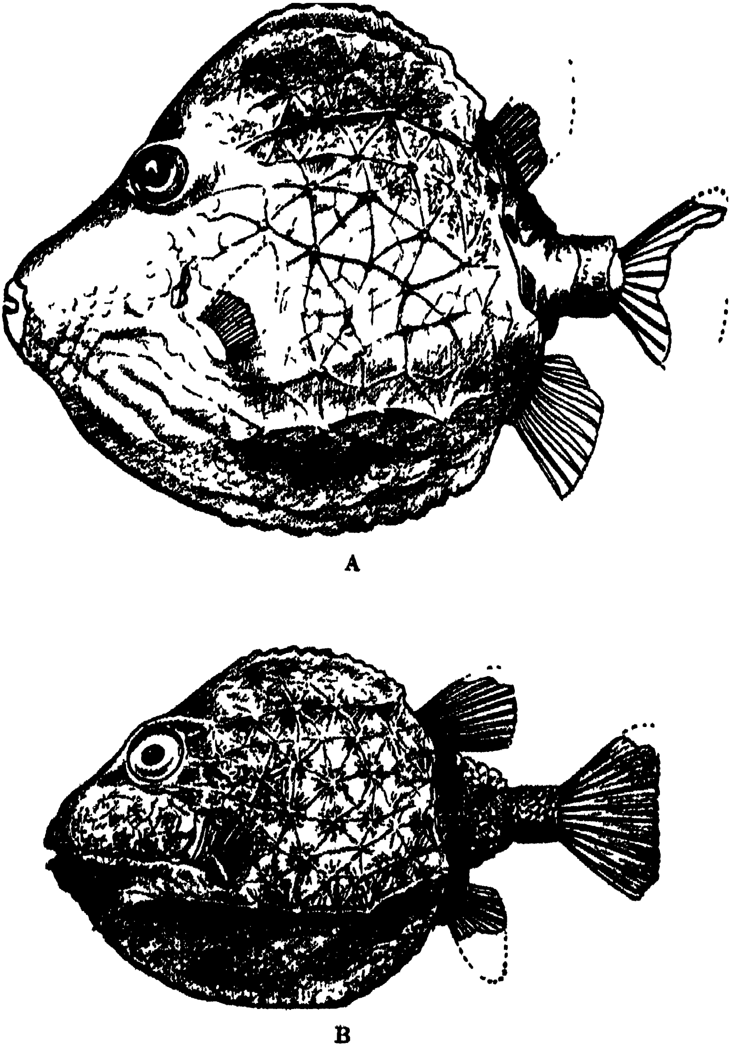
Anoplocapros amygdaloides, sp. n.

Aracana lenticularis Günther, 1870, Cat. Fish. Brit. Mus. viii. p. 268 (part.).

Anoplocapros lenticularis Fraser-Brunner, 1935, Ann. & Mag. Nat. Hist. ser. 10. xvi. p. 317 (non Richardson).

Carapace ovate, deep, laterally compressed, its greatest depth contained 1½ times in standard length of fish, its greatest width from side to side rather less than length of head. Length of head contained 3¼ times in length of fish. Snout straight or convex. Diameter of eye contained 2⅗ times in length of head, interorbital width (between anterior margins of orbit) 2⅔ times, gill-opening 3⅔ times.

Fig. 1.



A. *Anoplocapros lenticularis* (Richardson, 1841). Type.
B. *Anoplocapros amygdaloides*, sp n Type.

Dorsal ridge strong, elevated; lateral and pelvic ridge distinct, not prominent; ventral fold pronounced. Shields of carapace with small tubercles clustered about centres or on ridges, other parts smooth; a network so strongly raised lines or ribs radiating from more or less prominent tubercles in centres of plates. Tail bearing a large "island" of bony, tubercular plates behind the dorsal fin, and another behind the anal; a complete ring of plates, in one piece, round end of caudal peduncle. Dorsal and anal fins each with 10 rays; pectoral fin with 12.

Uniform brown.

Hab. Australia.

Described from the holotype, a stuffed specimen 132 mm. long, in the British Museum (Nat. Hist.). Two smaller examples (80 mm.) in the same collection and a spirit specimen received on loan from the Australian Museum also appear to belong to this species. The locality for the latter is given as Bass Strait, Victoria; unfortunately, the specimen has lost the end of the tail.

The shape of the carapace and the prominence of the ridges are suggestive of a large peach-stone, upon which resemblance the name is based.

The genus *Strophiurichthys* is closely allied to *Anoplocapros*, differing mainly in that there is not a complete ring of bony plates round the end of the tail, but two distinct patches or "islands" of plates.

Closer study of the specimens previously referred to my *S. inermis* now makes it necessary to distinguish a second form, though it is possible, when better material is available, that the two will prove to be the sexes of a single species. I have been unable to determine the sex in any of my specimens, however, so that in view of the strong differences shown it seems best to regard them for the time being as representing two species.

Strophiurichthys robustus, sp. n.

Anoplocapros lenticularis of previous authors (part.).
Strophiurichthys inermis Fraser-Brunner, 1935, Ann. & Mag. Nat. Hist. ser. 10, xvi. p. 318 (part.).

Carapace ovate, deep, rather wide across the centre, its greatest depth contained $1\frac{2}{3}$ times, in the standard length its greatest width from side to side equal to or greater than length of head. Length of head contained 4 times in length of fish. Profile of snout concave. Diameter of eye contained 3¼ times in length of head, interorbital width twice. Width of gill-opening about equal to diameter of eye.

Dorsal ridge moderately strong, slightly elevated; lateral ridges feeble, pelvic ridges more distinct; ventral fold moderately developed. Shields of carapace covered evenly with small, rough tubercles, which are, however, neither so small nor so numerous as in *S. inermis*. A few of the shields have prominent central tubercles which tend to form flat spines, especially in posterior part of carapace and on pelvic ridges. Tail bearing a large "island" of granular shields behind dorsal fin, and a similar one behind anal; two similar patches embrace the end of the caudal peduncle but do not unite. Dorsal and anal fins each with 10 rays; pectoral with 12.

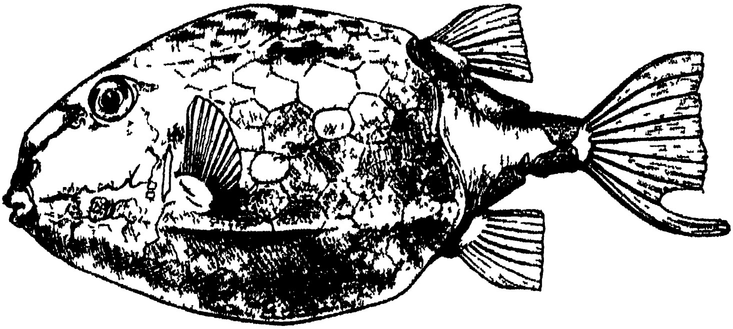


Fig 2 A.—*Strophiurichthys inermis* Fraser-Brunner, 1935. Type.

Yellowish brown; large dark spots on back and upper half of side.

Hab. Australia; Solomon Is.

Described from the holotype, 230 mm. long, from Australia, and a specimen 200 mm. long from the Solomon Is., both in the Brit. Mus. (Nat. Hist.). Also two specimens (160–215 mm.) from Port Jackson and Sydney (Australian Museum).

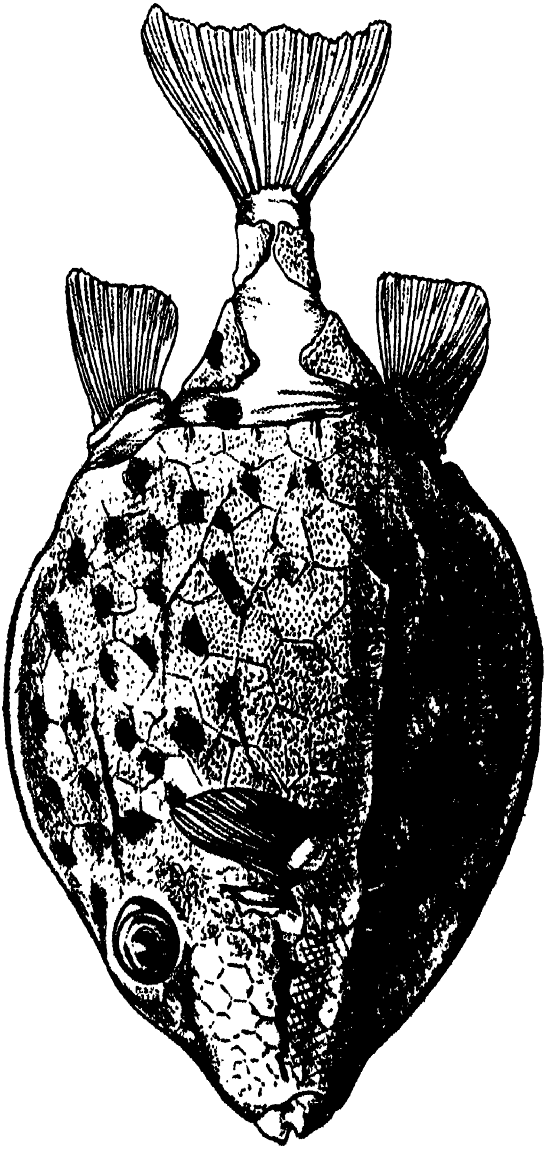


Fig. 2 B.—*Strophiurichthys robustus*, sp. n. Type.

The carapace is much deeper and broader, has more prominent ridges and stronger tubercles than in *S. inermis*, and the sculpturing of the shields is coarser. Comparison of specimens of the same size shows the head to be smaller and the interorbital width to be greater in *S. robustus* than in *S. inermis*. In *S. inermis* the profile of the snout is convex; in *S. robustus* it is concave.

XXIX.—*New or little-known* Tipulidæ (*Diptera*).—LXI. *Neotropical Species*.

By CHARLES P. ALEXANDER, Ph.D., F.R.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A.

THE species described at this time are virtually all from Peru, having been taken in Junin and Huanuco by Messrs. Paprzycki and Woytkowski. very efficient collectors of these fragile and neglected flies. One single specimen from Abitagua, Ecuador, collected by MacIntyre, has been added as a paratype of this species. I am greatly indebted to the various collectors for this collaboration in making known the rich fauna of Tropical America. The types of the novelties are preserved in my collection of these flies.

Limonia (*Limonia*) *dicax*, sp. n.

Allied to *lawlori*; general coloration dark liver-brown; rostrum and antennæ black; halteres with knobs black; femora brown, more yellowish basally, blackened at tips; tibiæ and tarsi black; wings with ground-colour strongly infuscated, especially the radial field; costal portion of wing variegated by four whitish areas before and beyond origin of *Rs* and the stigma; darker seams along cord and outer end of cell 1*st* M_2; stigmal trichia present; *Sc* long; abdomen brownish black, the proximal sternites more or less brightened on basal portions.

Female.—Length about 8·5–9 mm.; wing 10–11 mm.

Rostrum polished black; palpi dull black. Antennæ black throughout; flagellar segments oval, with short dark apical pedicels; longest verticils unilaterally arranged, nearly twice the length of the segments; terminal segment very long, twice the penultimate, strongly constricted at mid-length to simulate two distinct segments. Head brownish black; anterior vertex reduced to a linear strip or actually interrupted by the tangential contact of the eyes.

Pronotum and mesonotum deep liver-brown, polished, the median area of scutum and the scutellum more pruinose. Pleura dark liver-brown. Halteres with stem obscure yellow, knob black. Legs with the coxæ liver-brown; trochanters obscure yellow; femora brown, more yellow basally, the tips black; tibiæ and tarsi black. Wings with the ground-colour strongly infuscated, especially the radial field, the more posterior cells paler brown; conspicuous dark clouds at origin of *Rs*, fork of *Sc*, stigma, and as seams along cord and outer end of cell *1st* M_2; marginal dark clouds at ends of longitudinal veins, more distinct in median field; cells *C* and *Sc* more yellow; conspicuous whitened areas before and beyond the dark mark at origin of *Rs* and again before and beyond the stigma, in cases with one or more of these areas reduced in size; veins brown, *Sc* more yellow. Stigmal area with trichia. Venation: *Sc* long, Sc_1 ending shortly before level of fork of *Rs*, Sc_2 near its tip; *Rs* long, angulated to weak-spurred at origin; cell *1st* M_2 long, its inner end arcuated, subequal to or longer than vein M_{1+2} beyond it; *m–cu* subequal to or longer than the distal section of Cu_1, at or shortly before fork of *M*.

Abdomen brownish black, the more proximal sternites somewhat brightened on basal ring; genital shield and valves of ovipositor black, the cerci gently upcurved.

Hab. Peru (Junin).

Holotype, ♀, Huacapistana, Tarma, altitude 3600–5400 feet, February 25, 1940 (*Woytkowski*). *Paratopotypes*, 2 ♀♀, March 3–9, 1940.

Limonia (*Limonia*) *dicax* is readily told from all other members of the *lawlori* group by the unusual pattern of the wings. Members of the group have veins *Sc* and *Rs* very long, stigmal trichia usually present, and the terminal segment of antenna very long and strongly constricted at near mid-length.

Limonia (*Limonia*) *huacapistanæ*, sp. n.

Allied to *lawlori*; general coloration yellow, the pronotum and præscutum with a very conspicuous median black stripe, on the posterior sclerites of mesonotum even more extensive but paling to dark brown; antennæ black, flagellar segments oval with short glabrous apical pedicels; pleura and pleurotergite uniformly yellow; legs black, the femora with a narrow obscure yellow ring; wings pale yellow, restrictedly patterned with dark brown; stigma pale brown, hairy; Sc_1 ending about opposite two-thirds the length of *Rs*; basal section of R_{4+5} arcuated; abdominal tergites broadly darkened medially just before the pale posterior borders.

Female --Length about 11 mm; wing 10·5 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval, with short glabrous apical pedicels. Head black, the front and anterior vertex grey pruinose; anterior vertex reduced to a linear strip that is only about one-fourth as wide as the diameter of scape.

Pronotum and præscutum yellow, with a continuous, very conspicuous, black median stripe, behind the suture more brownish but covering almost all the area, only the outer portions of the scutal lobes, the parascutella, and the pleurotergite brightening to yellow; surface of scutellum and mediotergite insensibly pruinose. Pleura and pleurotergite, with the dorsopleural membrane, uniformly yellow. Halteres obscure yellow. Legs with the coxæ and trochanters yellow; femora black, with a narrow, obscure yellow subterminal ring, this shorter than the blackened apex; tibiæ black, tarsi brownish black; claws with conspicuous teeth. Wings pale yellow, the costal and outer radial fields more brownish yellow; a restricted dark brown pattern, as follows:—Origin of *Rs*; fork of *Sc*; free tip of Sc_2; cord and outer end of cell 1*st* M_2; small marginal spots at ends of all longitudinal veins; stigma pale brown, with several macrotrichia; veins yellow, darker in the infuscated portions. Venation: *Sc* long, Sc_1 ending about opposite two-thirds *Rs*, Sc_2 at its tip; *Rs* angulated at origin; R_2 lying shortly beyond level of free tip of Sc_2; basal section of R_{4+5} strongly arcuated; *m–cu* at or before fork of *M*.

Abdomen obscure brownish yellow, the tergites broadly darkened medially just before the pale posterior borders; genital segment obscure yellow. Ovipositor with the cerci very small and slender, upcurved.

Hab. Peru (Junin).

Holotype, ♀, Huacapistana, Tarma, altitude 3600–5400 feet, February 25, 1940 (*Woytkowski*).

Limonia (*Limonia*) *huacapistanæ* is closest to *L.* (*L.*) *immodica* Alexander (south-eastern Brazil), *L.* (*L.*) *lawlori* Alexander (Panama to Ecuador), *L.* (*L.*) *lustralis* Alexander (Ecuador), *L.* (*L.*) *roraimæ* Alexander (Venezuela) and *L.* (*L.*) *sanctæ-martæ* Alexander (Colombia), differing from all in the pattern of the body, legs and wings. All of the above, with the exception of *roraimæ*, have several stigmal trichia lying proximad of vein R_2.

Limonia (*Neolimnobia*) *paprzyckii*, sp. n. (Figs. 1 & 2.)

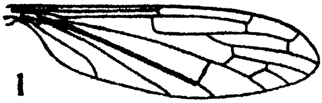
General coloration yellow, the mesonotum narrowly but conspicuously patterned with black ; legs black, the femora with a very narrow yellow ring at about four-fifths the length ; wings pale yellow, restrictedly patterned with dark brown ; *Sc* short ; *Rs* in longitudinal alignment with R_{2+3} ; supernumerary cross-vein lying far distad ; *m–cu* before fork of *M* ; abdomen yellow, the tergites with posterior borders narrowly darkened ; rostral spines of male hypopygium very short and acute.

Male.—Length about 4 mm. ; wing 4·5 mm.

Female.—Length about 5 mm. ; wing 5 mm.

Rostrum and palpi black. Antennæ with scape black, pedicel obscure yellow, flagellum black ; basal flagellar segments oval, the outer ones broken. Head buffy yellow, the central portion of anterior vertex darkened.

Pronotum darkened medially and on anterior portion, the remainder yellow. Mesonotum pale yellow, conspicuously patterned with black, including a narrow median vitta on præscutum that is still narrower on posterior half, at the suture forking, with a branch occupying the mesal edge of each scutal lobe ; posterior border of scutellum darkened ; mediotergite with a narrow but conspicuous central blackening. Pleura yellow. Halteres pale yellow, the apex of knob infuscated. Legs with coxæ and trochanters pale yellow ; remainder of legs black, the femora with a ver ynarrow to scarcely evident yellow ring at near four-fifths the length ; extreme femoral bases brightened. Wings (fig. 1) pale yellow, restrictedly but conspicuously patterned with dark brown, the areas arranged as follows :—Arculus; fork of *Sc* and origin of *Rs* ; free tip of Sc_2 and R_2 ; cord and outer end of cell *1st* M_2 ; supernumerary cross-vein in cell R_3 and tip of vein R_3 beyond it ; smaller marginal areas at ends of all longitudinal veins ; a larger area in cell *1st A* near outer end of vein *2nd A* ; veins yellow, conspicuously darkened in the patterned areas. Venation: *Sc* short, Sc_1 ending just beyond the rectangular origin of *Rs*, Sc_2 close to its tip ; *Rs* in direct longitudinal alignment with R_{2+3} ; a supernumerary cross-vein in cell R_3 about its own length before the upturned tip of the latter vein ; in the right wing of the holotype, a further adventitious cross-vein in cell R_4 beneath the supernumerary vein in cell R_3 ; *m–cu* some distance before the fork of *M*.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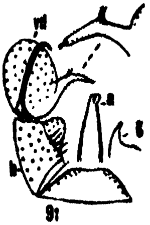

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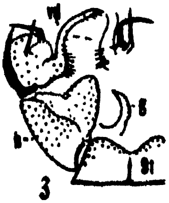

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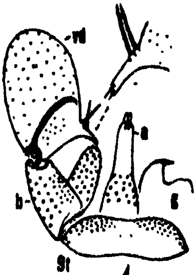

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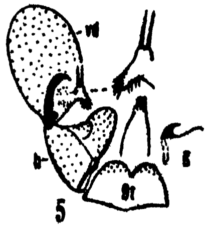

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Fig. 1.—*Limonia* (*Neolimnobia*) *paprzyckii*, sp. n. ; venation.
Fig. 2.—*Limonia* (*Neolimnobia*) *paprzyckii*, sp. n. ; male hypopygium.
Fig. 3.—*Limonia* (*Geranomyia*) *contorta*, sp. n. ; male hypopygium.
Fig. 4.—*Limonia* (*Geranomyia*) *diargyria*, sp. n. ; male hypopygium.
Fig. 5.—*Limonia* (*Geranomyia*) *stoica*, sp. n. ; male hypopygium.

Symbols : *a*, ædeagus ; *b*, basistyle ; *g*, gonapophysis ; *t*, 9th tergite ; *vd*, ventral dististyle.

Abdomen yellow, the tergites with their posterior borders narrowly darkened, on the basal segments paler and restricted to the central portion of the segment, on the outer segments darker and more extensive; subterminal segment and genital shield light yellow; sternites yellow. Ovipositor with cerci slender, upcurved. Male hypopygium (fig. 2) with the tergite, *9t*, narrowed outwardly, the caudal margin truncate or virtually so. Basistyle, *b*, with the ventromesal lobe short and stout; mesal face of style cephalad of lobe with several strong black setæ. Dorsal dististyle a nearly straight rod that is about equal in length to the ventral dististyle, its tip decurved, acute and blackened. Ventral dististyle, *vd*, relatively small, oval, the rostral prolongation long, bent or arcuated at near mid-length and here on outer margin with two very short acute spines; apex of prolongation obtuse. Gonapophyses, *g*, with mesal-apical lobe pale, erect, gradually narrowed to the acute tip.

Hab. Peru (Junin).

Holotype, ♀, Satipo, Jauja, altitude 800–900 metres, May 31, 1940 (*Paprzycki*). *Allotopotype*, ♂, January 20, 1940.

I take great pleasure in naming this very distinct fly in honour of the collector, Mr. Pedro Paprzycki, who has collected numerous crane-flies in the vicinity of Satipo. In its general appearance it is most like species of the subgenus *Limonia* belonging to the *repanda* group, especially *Limonia* (*Limonia*) *contradistincta* Alexander (south-eastern Brazil). The details of pattern of the wings and legs, as well as the venation, are quite different from those of *contradistincta*. Because of the supernumerary cross-vein in cell R_3, the species must be referred to the subgenus *Neolimnobia*, where it is most similar to *L.* (*N.*) *ran slucida* Alexander (Panama).

Limonia (*Geranomyia*) *callinota*, sp. n.

General coloration of body yellow, the mesonotum handsomely patterned with dark brown, including a single broad median stripe on præscutum and mediotergite; rostrum relatively short; femora brown, the tips narrowly obscure yellow; wings pale greyish yellow, restrictedly patterned with brown, the markings chiefly marginal; cord and outer end of cell *1st* M_2 only slightly seamed with darker; *Sc* short, Sc_1 ending about opposite one-fourth the length of *Rs* ; abdominal tergites uniformly dark brown, unpatterned.

Female.—Length, excluding rostrum, about 6·5 mm.;i wing 7·5 mm. ; rostrum about 2·6 mm.

Rostrum and maxillary palpi black, the short tips of the labial palpi paler. Antennæ black throughout ; flagellar segments oval ; terminal segment very long, approximately twice the penultimate, narrowed outwardly. Head light grey, the sides of the posterior vertex darker ; eyes large ; anterior vertex (female) reduced to a narrow strip that is slightly more than one-third the diameter of scape.

Pronotum very small, dark brown above, paler on sides. Mesonotum bright yellow, handsomely and conspicuously patterned with dark brown, including a single broad median stripe on præscutum that contrasts abruptly with the broad lateral ground borders ; median region of scutum testaceous yellow, the lobes dark brown ; scutellum and parascutella testaceous yellow ; mediotergite broadly dark brown on central portion, the narrow lateral borders and all of pleurotergite pale yellow. Pleura uniformly yellow. Halteres with stem brownish yellow, the base clearer yellow, knob brown. Legs with coxæ and trochanters pale yellow ; femora brown, the tips narrowly obscure yellow, with a vaguely darker subterminal ring ; tibiæ and tarsi light brown, the terminal tarsal segments black. Wings pale greyish yellow, rather restrictedly patterned with brown, the markings chiefly marginal ; larger brown areas at supernumerary cross-vein in cell *Sc* ; a common mark at fork of *Sc* and origin of *Rs* ; stigma ; smaller brown marginal clouds at ends of veins R_3, Cu_1, *1st A* and *2nd A*, the last two larger ; cord and outer end of cell *1st* M_2 very slightly seamed with darker ; veins yellow, darker in the patterned areas. Venation : *Sc* relatively short, Sc_1 ending about opposite one-fourth the length of *Rs*, Sc_2 at its tip ; a supernumerary cross-vein in cell *Sc* ; *m–cu* close to fork of *M*.

Abdominal tergites dark brown, unpatterned ; sternites more yellowish brown ; genital segment obscure yellow. Ovipositor with cerci slender, only gently curved.

Hab. Peru (Junin).

Holotype, ♀, Carpapata, Tarma, altitude 2600 metres, May 15, 1940 (*Woytkowski*).

Limonia (*Geranomyia*) *callinota* is entirely different from the now very numerous species of the subgenus in Tropical America. In its wing-pattern it much resembles the otherwise very different *L.* (*G.*) *marthæ* Alexander, of Colombia and Venezuela.

Limonia (*Geranomyia*) *contorta*, sp. n. (Fig. 3.)

Belongs to *lachrymalis* group, close to *lachrymalis*; male hypopygium with two rostral spines, one arising from a long basal tubercle.

Male.—Length, excluding rostrum, about 6–7 mm.; wing 7–8·5 mm.; rostrum about 3–3·3 mm.

Female.—Length, excluding rostrum, about 6·5–7 mm.; wing 7–8 mm.; rostrum about 3–3·5 mm.

Rostrum black. Antennæ black; flagellar segments oval to long-oval. Head black.

Thorax uniformly blackened. Halteres black, the base of stem restrictedly yellow. Legs black, the posterior coxæ a trifle paler. Wings with a strong blackish tinge, the oval stigma a little darker; veins brown. Venation: *Sc* short, Sc_1 ending opposite or just beyond origin of *Rs*; cell *1st* M_2 considerably longer than vein M_{1+2} beyond it.

Abdomen black, more or less pruinose, the basal sternites a little brightened, especially in female. Male hypopygium (fig. 3) with the tergite, *9t*, deeply notched medially. Remainder of hypopygium much as in *lachrymalis*, but with two rostral spines, one straight, the other crossing it at a right-angle, arising from a long basal tubercle.

Hab. Peru (Junin).

Holotype, ♂, Huacapistana, Tarma, altitude 3600–5400 feet, February 14, 1940 (*Woytkowski*). *Allototype*, ♀, Carpapata, altitude 2600 metres, May 6, 1940 (*Woytkowski*). *Paratopotypes*, 2 ♀♀, February 5–14, 1940; *paratypes*, 2 ♂♂, 1 ♀, with the allotype, May 1–10, 1940.

Limonia (*Geranomyia*) *contorta* is allied to *L.* (*G.*) *lachrymalis* Alexander (Mexico-Peru), differing especially in the details of structure of the male hypopygium, notably the two rostral spines. In *lachrymalis* there is a single rostral spine, arising from a relatively short tubercle.

Limonia (Geranomyia) diargyria, sp. n. (Fig. 4.)

Belongs to the *biargentata* group; mesonotal præscutum with disk light orange-yellow, bordered laterally by a narrow silvery line; median area of scutum and scutellum with a common central silver vitta; pleura obscure yellow; femora yellow, with a narrow black subterminal ring; wings brownish yellow, sparsely patterned with brown; male hypopygium with the ninth tergite only gently emarginate; ventral dististyle very large and fleshy, its area about equal to twice the total area of basistyle; gonapophyses with mesal apical blade broad, extending caudad of the lateral lobe of the apophysis.

Male.—Length, excluding rostrum, about 5·5 mm.; wing 7 mm.; rostrum about 4 mm.

Rostrum brownish black throughout, relatively long; maxillary palpi black. Antennæ with scape and pedicel dark brown, flagellum more brownish yellow; flagellar segments cylindrical, the longest verticils unilaterally arranged, more than one-half longer than the segment. Head with anterior vertex silvery; posterior vertex dull black, with a narrow median silvery line.

Mesonotal præscutum light orange-yellow, the sublateral portions on either side with a narrow silvery line, bordered internally by a faintly darkened line; lateral præscutal border narrowly darkened; scutal lobes obscure orange, the median area and scutellum pale brown with a narrow median silvery line running the length of both; mediotergite obscure brownish yellow. Pleura obscure yellow. Halteres with stem yellow, knob dark brown. Legs with the coxæ and trochanters pale yellow; femora yellow with a narrow but very conspicuous black subterminal ring, removed from the tip a distance about equal to three times its own width; tibiæ and tarsi brownish yellow to pale brown. Wings brownish yellow, the prearcular and costal fields clearer yellow; a very restricted brown pattern, including the stigma; three costal spots at the supernumerary cross-vein in cell *Sc*, origin of *Rs* and fork of *Sc*, respectively; cord and outer end of cell *1st* M_2 very narrowly and insensibly seamed with brown; veins beyond cord pale brown, darker in clouded portions; veins in basal parts of wing more yellow. Venation: Sc_1 ending just before mid-length of *Rs*, Sc_2 at its tip; *m–cu* before the fork of *M*.

Abdomen brownish yellow to obscure yellow, the ncisures weakly darkened; hypopygium obscure yellow. Male hypopygium (fig. 4) with the tergite, *9t*, transverse' the caudal margin very gently emarginate. Basistyle, *b*, with the ventromesal lobe relatively long but simple. Dorsal dististyle a gently curved rod, the decurved tip acute. Ventral dististyle, *vd*, unusually large for a member of the *biargentata* group, in area about twice the total extent of the basistyle; rostral prolongation slender, the spines slightly exceeding the prolongation in length, arising from short equal tubercles that are close together at their bases. Gonapophyses, *g*, with mesal apical lobe broad, extending much farther caudad than the lateral lobe of the apophysis, ending in an acute black spine.

Hab. Peru (Huanuco).

Holotype, ♂, Pumahuasi, altitude 980 metres, July 25, 1939 (*Woytkowski*).

Limonia (*Geranomyia*) *diargyria* is closest to *L.* (*G.*) *lemniscata* Alexander (Paraguay), which it resembles in general size and colour. It differs especially in the structure of the male hypopygium, notably the tergite, ventral dististyle and gonapophysis.

Limonia (*Geranomyia*) *transitoria*, sp. n.

Size large (wing, female, over 9 mm.); general coloration of præscutum light grey, with five dark stripes, the discal three black and very clearly defined, wider than the interspaces; rostrum long, exceeding one-half the length of wing; posterior sclerites of notum and the pleura dark brown; femora brown with a darker brown subterminal ring that is preceded and followed by clear yellow annuli; tibiæ brown; tarsi obscure yellow; wings with a weak brown tinge, very restrictedly patterned with darker; *Sc* and *Rs* long; abdominal tergites uniformly black.

Female.—Length, excluding rostrum, about 8 mm.; wing 9·5 mm.; rostrum about 5·5 mm.

Rostrum elongate, exceeding one-half the wing, black, the tips of the labial palpi slightly paler. Antennæ black; flagellar segments cylindrical, the verticils a little shorter than the segments. Head black, the sublateral and median areas of vertex light grey; anterior vertex reduced to a linear strip.

Pronotum broadly black medially and on sides, the dark areas divided by narrow yellowish grey lines. Mesonotal præscutum grey, with three very distinct black lines that are a little wider than the ground interspaces; lateral præscutal borders somewhat more broadly brownish black; scutum and scutellum brown, with a continuous narrow pale median vitta extending the length of both, narrowed to a point behind; mediotergite dark brown. Pleura almost uniformly dark brown, including the dorsopleural membrane. Halteres with stem obscure yellow, knob brownish black. Legs with the coxæ brown, the fore pair somewhat darker; trochanters brownish yellow; femora brown, with a darker brown subterminal ring that is preceded and followed by clear yellow rings, the apical one narrower than the subterminal; tibiæ brown; tarsi paling to yellow. Wings with a weak brownish tinge, very restrictedly patterned with darker, including small areas at origin of *Rs*, stigma, cord and outer end of cell *1st* M_2; supernumerary cross-vein in cell *Sc* and tip of vein *Sc* scarcely darkened; veins brown. Venation: *Sc* long, Sc_1 ending shortly before fork of the long *Rs*, Sc_2 a little removed from its tip; a supernumerary cross-vein in cell *Sc*; *Rs* about four times the length of the basal section of R_{4+5}; cell *1st* M_2 long, subequal to vein M_{1+2} beyond it; *m–cu* close to fork of *M*.

Abdominal tergites uniformly black, sternites dark brown; subterminal segments paler; cerci long and straight.

Hab. Peru (Junin).

Holotype, ♀, Huacapistana, Tarma, altitude 3600–5400 feet, March 1, 1940 (*Woytkowski*).

Superficially the present fly resembles dark-coloured species of the subgenus such as *Limonia* (*Geranomyia*) *cerberus* (Alexander) and *L.* (*G.*) *lachrymalis* (Alexander), but the præscutal pattern, elongate rostrum, very long vein *Sc*, and other characters indicate that it is very distinct.

Limonia (*Geranomyia*) *subgaudens*, sp. n.

Size large (wing, female, 10 mm. or more); rostrum elongate, approximately one-half the length of body; general coloration grey, the præscutum with three narrow black stripes; scutellum broad, pale brown; halteres with stem yellow, knob brownish black; femora brown, the tips broadly yellow, enclosing a broad, dark brown, subterminal ring; wings whitened, conspicuously patterned with brown; stigma buffy brown with both its inner and outer ends darkened; *Sc* long, the dark area at its tip disconnected from the area at origin of *Rs*; cell 1st M_2 a little longer than vein M_{1+2} beyond it.

Female.—Length, excluding rostrum, about 8·5–10 mm.; wing 10–11·5 mm.; rostrum about 4–5 mm.

Rostrum black throughout, relatively long, as shown by the measurements, being approximately one-half the length of the body. Antennæ black; basal flagellar segments short-oval to subcylindrical, the outer segments more elongate. Head with the anterior vertex silvery, the colour produced backward over the posterior vertex to the occiput, the remainder of vertex black.

Pronotum grey. Mesonotal præscutum grey, with three narrow but conspicuous black stripes, the median one narrowed posteriorly but reaching the suture; sublateral stripes approximately equal in width for their entire extent, crossing the suture on to the mesal portion of each scutal lobe; extreme lateral borders of præscutum not or scarcely darkened; median area of scutum and the broad scutellum pale brown, the latter with vague indications of two darker submedian stripes; postnotum black, sparsely pruinose. Pleura grey, sparsely variegated with slightly more darkened areas. Halteres with stem yellow, knob brownish black. Legs with coxæ more or less infuscated, paler apically; trochanters obscure yellow; femora brown, their bases restrictedly yellow, the tips broadly yellow, enclosing a broad, dark brown, subterminal ring; tibiæ and tarsi brownish yellow, the terminal tarsal segments blackened. Wings with the ground-colour whitened, the costal region a little more yellowish ; a rather restricted but conspicuous dark brown pattern, arranged as follows :—Seams at arculus, supernumerary cross-vein in cell *Sc*, origin of *Rs*, fork of *Sc*, cord, outer end of cell *1st* M_2 and as conspicuous clouds before mid-length of cell R_3, near outer end of cell R_5 and on distal fourth of vein *M* and along M_{3+4} ; conspicuous seams on distal third of vein *1st A* and outer half of vein *2nd A*, the latter especially conspicuous ; more or less distinct seams at tip of vein R_3 and along distal section of vein M_3 ; a small rounded dark cloud at axillary border of cell *2nd A* ; stigma with centre pale buffy brown, each end bordered by darker brown ; veins yellow, darker in the patterned areas. Venation : *Sc* long, ending near two-thirds the length of *Rs*, Sc_2 near its tip ; a supernumerary cross-vein in cell *Sc* ; cell *1st* M_2 a little longer than vein M_{1+2} beyond it ; *m–cu* at or just before the fork of *M*.

Abdomen dark brown to brownish black, sparsely grey pruinose, the posterior borders of the sternites in certain cases restrictedly pale ; genital segment (female) reddish brown.

Hab. Peru (Junin).

Holotype, ♀, Huasahuasi, Tarma, altitude 2800 metres, April 24, 1940 (*Woytkowski*). *Paratopotype*, 1 ♀, April 23, 1940.

Limonia (*Geranomyia*) *subgaudens* is closest to *L.* (*G.*) *gaudens* Alexander and *L.* (*G.*) *laudanda* Alexander. It differs from the latter especially in the long *Sc*, with the darkened areas at fork of *Sc* and at origin of *Rs* disconnected. From *gaudens* it differs conspicuously in the venation and in all details of wing-pattern.

Limonia (*Geranomyia*) *stoica*, sp. n. (Fig. 5.)

Size large (wing 9 mm. or more) ; general coloration grey, the præscutum with three narrow blackish stripes ; halteres pale yellow ; femora brown, the tips darker ; tibiæ and tarsi brownish black to black ; wings brownish yellow, with a restricted dark pattern ; *Sc* long, Sc_1 ending opposite or just beyond mid-length of *Rs* ; cell

1st M_2 longer than the veins beyond it; male hypopygium with the tergite deeply notched medially; ventral dististyle large and fleshy, its rostral prolongation small; rostral spines two, straight, arising from a common sclerotized low flange or tubercle; gonapophyses with mesal apical lobe short and curved, blackened.

Male.—Length, excluding rostrum, about 7·5–8 mm.; wing 9–10·5 mm.; rostrum about 2·7–3 mm.

Female.—Length, excluding rostrum, about 8–8·5 mm.; wing 10–10·5 mm.; rostrum 3–3·3 mm.

Rostrum black throughout, relatively short, being only a little more than one-third the length of body. Antennæ black throughout; flagellar segments cylindrical, the terminal segment subequal in length to the penultimate; verticils short. Head in both sexes with the anterior vertex narrower than the diameter of scape, silvery, this colour continued back across the posterior vertex to the occiput, bordered on either side by blackish, the remainder of head grey.

Pronotum dark grey. Mesonotal præscutum grey, with three narrow blackish stripes, the median one more intense, narrowed behind and not reaching the suture, the laterals narrowed in front; lateral præscutal borders not blackened; posterior sclerites of notum grey, the scutellum a little more brownish, sparsely pruinose; scutal lobes slightly darkened on cephalic and mesal borders. Pleura brownish grey, the ventral sternopleurite and ventral pleurotergite narrowly blackened; a black line across ventral anepisternum; dorsopleural membrane obscure yellow. Halteres pale yellow. Legs with coxæ reddish brown, the surface sparsely pruinose, the tips paler; trochanters obscure yellow; femora brown, the tips darker, the bases vaguely brightened; tibiæ and tarsi passing through brownish black to black. Wings with the ground-colour brownish yellow, sparsely patterned with darker, including small areas at the supernumerary cross-vein in cell *Sc*, origin of *Rs*, fork of *Sc*, cord and outer end of cell *1st* M_2; stigma oval, relatively small, brown. Venation: *Sc* long, Sc_1 ending opposite one-half to three-fifths the length of *Rs*, Sc_2 near its tip; cell *1st* M_2 longer than the veins beyond it.

Abdominal tergites dark brown, sparsely pruinose, the lateral borders narrowly paler; basal sternites obscure yellow, the outer segments black, sparsely pruinose, the posterior borders narrowly pale; hypopygium dark. Male hypopygium (fig. 5) with the tergite deeply notched medially, the lateral lobes conspicuous, rounded. Basistyle, *b*, relatively small, the ventro-mesal lobe of moderate size, with an accessory lobule or protuberance on caudal margin near base. Dorsal dististyle relatively small, the tip acute. Ventral dististyle, *vd*, large, its total area exceeding twice that of basistyle; rostral prolongation small, the two rostral spines from a common basal tubercle or flange, the spines straight and relatively short. Gonapophyses, *g*, with mesal apical lobe short and curved, the blackened tips acute, the concave margin smooth or more or less serrulate. Ædeagus narrowed to apex.

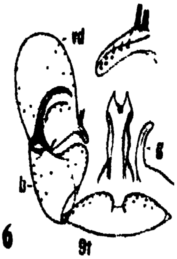
Hab. Peru (Junin).

Holotype, ♂, Carpapata, Tarma, altitude 2600 metres, May 8, 1940 (*Woytkowski*). *Allotopotype*, ♀, pinned with type. *Paratopotypes*, 10 ♂♂, May 3–23, 1940; *paratypes*, 1 ♂, 1 ♀, Huacapistana, altitude 3600–5400 feet, February 11, 1940 (*Woytkowski*).

Limonia (*Geranomyia*) *stoica* differs from the other regional species that have three narrow dark præscutal stripes and long vein *Sc* in its large size, almost unvariegated legs, pale halteres, sparsely patterned wings, and in the structure of the male hypopygium. In its general appearance and structure of the hypopygium it most resembles *L.* (*G.*) *serotina* Alexander and *L.* (*G.*) *subserotina* Alexander, of Argentina, yet is quite distinct.

Limonia (*Geranomyia*) *provocator*, sp. n. (Fig. 6.)

Mesonotal præscutum light grey, the disk with three narrow black stripes that are subequal in extent to the interspaces; scutellum and broad median area of scutum yellow; posterior sclerites of notum and the pleura black; legs black, the tips of femora very narrowly pale; wings broad, weakly tinged with brown, sparsely patterned with pale brown, including a common area at fork of *Sc* and origin of *Rs*; stigma darkened; Sc_1 ending opposite origin of *Rs*; abdominal tergites brownish black, sternites a little paler; male hypopygium with the caudal margin of tergite emarginate medially; ventral dististyle large, rostral spines two, separate, unequal, placed at base of prolongation; gonapophyses with mesal apical lobe slender, pale; ædeagus terminating in two pale triangular lobes.



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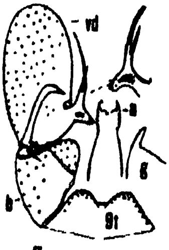

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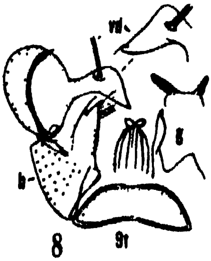

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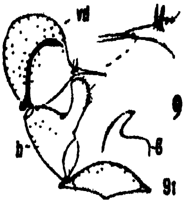

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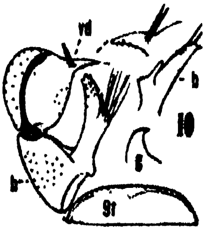

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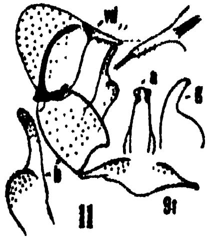

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Fig. 6.—*Limonia* (*Geranomyia*) *provocator*, sp. n.; male hypopygium.
Fig. 7.—*Limonia* (*Geranomyia*) *conquisita*, sp. n.; male hypopygium.
Fig. 8.—*Limonia* (*Rhipidia*) *invaripennis*, sp. n.; male hypopygium.
Fig. 9.—*Limonia* (*Rhipidia*) *profana*, sp. n.; male hypopygium.
Fig. 10.—*Limonia* (*Rhipidia*) *succentiva*, sp. n.; male hypopygium.
Fig. 11.—*Limonia* (*Rhipidia*) *vafra*, sp. n.; male hypopygium.

Symbols: *a*, ædeagus; *b*, basistyle; *g*, gonapophysis; *t*, 9th tergite; *vd*, ventral dististyle.

Male.—Length, excluding rostrum, about 6 mm.; wing 8·8–9 mm.; rostrum about 4 mm.

Rostrum a little less than one-half the length of wing, black, the labial palpi paler at tips. Antennæ black throughout; flagellar segments subcylindrical, crowded. Head grey, the central area lighter ashy grey, on posterior vertex with a blackened area on either side of this midline; anterior vertex narrower than the diameter of scape.

Pronotum grey, narrowly blackened medially above. Mesonotal præscutum light grey, the disk with three narrow black stripes that are subequal in extent to the interspaces; lateral præscutal margins scarcely darkened, in cases paling to buffy; humeral region restrictedly pale; the broad median area of scutum, with the scutellum and parascutella, yellow, the centres of scutal lobes black; mediotergite brownish black. Pleura dark, sparsely pruinose, the dorsopleural region light yellow; meral region paler. Halteres with stem pale, knob darkened. Legs with coxæ yellow, the fore and middle pair darker except at tips; trochanters testaceous yellow; femora black, the bases obscure yellow, the tips very narrowly and insensibly paler, in cases more abruptly and conspicuously so; tibiæ and tarsi black. Wings broad; ground-colour weakly brown with a very restricted pale brown pattern, including seams at the supernumerary cross-vein in cell *Sc*; fork of *Sc* and origin of *Rs*; stigma; cord and outer end of cell *1st* M_2 not darkened; veins pale brown. Venation: *Sc* very short, Sc_1 ending opposite to just beyond origin of *Rs*, Sc_2 at its tip; *m–cu* close to fork of *M*.

Abdominal tergites brownish black; sternites brownish yellow; hypopygium dark. Male hypopygium (fig. 6) with the median region of tergite deeply emarginate. Basistyle, *b*, with the ventromesal lobe rather large, simple. Ventral dististyle, *vd*, large and fleshy, more than twice as extensive as the basistyle; rostral prolongation with two unequal spines near base, these arising from short individual tubercles; spines placed close together, the outermost one a little longer. Dorsal dististyle strongly curved, the decurved tip acute. Gonapophyses, *g*, with mesal apical lobes slender, pale. Ædeagus, *a*, terminating in two lobes that are extended caudad into pale triangular points.

Hab. Peru (Junin).

Holotype, ♂, Huasahuasi, Tarma, altitude 2800 metres, April 7, 1940 (*Woytkowski*). *Paratopotype*, ♂, April 19, 1940.

Limonia (*Geranomyia*) *provocator* is well distinguished from other species having tristriate mesonotal præscuta by the blackened femora with pale tips, the very restricted dark wing pattern, short *Sc*, and in the details of structure of the male hypopygium. It is most similar to *L.* (*G.*) *inæquispinosa* Alexander (Ecuador), yet amply distinct.

Limonia (*Geranomyia*) *conquisita*, sp. n. (Fig. 7.)

Size small (wing, male, less than 4·5 mm.); general coloration buffy grey, the præscutum with three conspicuous black stripes, additional to the darkened lateral borders; legs brown to brownish black, the femoral tips narrowly and vaguely paler; wings faintly tinged with brown, the oval stigma darker brown; no other distinct dark marks except a vague cloud at fork of *Sc*; vein *Sc* short; male hypopygium with the rostral prolongation of the ventral dististyle small, bearing a long conspicuous tubercle that is provided with two unequal spines, the terminal one longer, the smaller spine shortly removed from the summit of tubercle.

Male.—Length, excluding rostrum, about 4 mm.; wing 4·3 mm.; rostrum about 2 mm.

Rostrum about one-half as long as the body, brownish black. Antennæ black throughout; flagellar segments oval. Head grey, with a narrow pale median line, this latter on posterior vertex bordered by extensive blackened areas.

Pronotum buffy grey, narrowly darkened medially. Mesonotal præscutum buffy grey, with three conspicuous black stripes in addition to the darkened lateral borders, the stripes wider than the interspaces; scutal lobes dark brown, the median area paler; scutellum brown, the posterior portion paler; mediotergite brown. Pleura brownish testaceous, paler ventrally. Halteres pale, the knobs dark brown. Legs with the coxæ and trochanters testaceous yellow; femora brown, the tips very narrowly and vaguely paler; tibiæ and tarsi brownish black. Wings faintly tinged with brown, the oval stigma darker brown; a scarcely indicated brown cloud at fork of *Sc* and origin of *Rs*; veins pale brown. Venation: *Sc* short, Sc_1 ending just beyond origin of *Rs*, Sc_2 at its tip; a supernumerary cross-vein at near mid-length of cell *Sc*; R_2 shorter than the free tip of Sc_2; basal section of R_{4+5} oblique, about one-half longer than *r–m*; *m–cu* before fork of *M*; cell *2nd A* relatively wide.

Abdomen, including hypopygium, dark brown; basal sternites yellow. Male hypopygium (fig. 7) with the caudal border of tergite, *9t*, conspicuously emarginate. Ventral dististyle, *vd*, much larger than the basistyle, the rostral prolongation short, with a conspicuous cylindrical tubercle near its base; rostral spines very unequal in size, both arising at or near the summit of the tubercle; terminal spine longest, gently curved, about twice the length of tubercle; second spine slightly subterminal in position, straight, a little shorter than the tubercle but longer than the apical portion of the prolongation.

Hab. Peru (Junin).

Holotype, ♂, Huacapistana, Tarma, altitude 3600–5400 feet, February 5, 1940 (*Woytkowski*).

From the other regional members of the subgenus having the disk of the præscutum conspicuously trivittate with dark brown or black, the present fly is well-distinguished by the small size, unpatterned legs, very restricted wing-pattern, short *Sc*, and by the quite distinct male hypopygium, notably the ventral dististyle and its rostral prolongation. Among other species the fly is most similar of *Limonia* (*Geranomyia*) *fluxa* Alexander, yet differs in all details of structure of the male hypopygium.

Limonia (*Geranomyia*) *æquabilis deplexa*, subsp. n.

Differs from the typical form, *æquabilis* Alexander, of northern Argentina, chiefly in the details of structure of the male hypopygium, notably the rostral prolongation of the ventral dististyle and its spines. These spines are so closely approximated or fused as to appear like a single long spine directed mesad or cephalad; the common basal tubercle, while very large and tumid, is smaller than in the typical form and is apically produced into a more slender neck-like portion that is well elevated above the body of the lobe. The typical form has this basal tubercle exceedingly large and tumid, with virtually its whole length appressed to the prolongation, the neck portion short and only slightly elevated.

Hab. Peru (Junin).

Holotype, ♂, Huacapistana, Tarma, altitude 3600–5400 feet, February 14, 1940 (*Woytkowski*). *Allotype*, ♀, pinned with type. *Paratopotypes*, 6 ♂♂, February 4–March 1, 1940; *paratype*, 1 ♂, Carpapata, Tarma, altitude 2600 metres, May 4, 1940 (*Woytkowski*).

Limonia (*Rhipidia*) *nobilissima*, sp. n.

Size very large (wing, female, over 12 mm.); general coloration grey; thoracic pleura with a broad, brownish black, longitudinal stripe; knobs of halteres infuscated; femora brownish yellow, with a narrow, virtually terminal, dark brown ring; wings whitish subhyaline, spotted and dotted with brown; *Sc* long, Sc_1 ending opposite or beyond three-fourths the length of the long *Rs*; *m–cu* before fork of *M*; abdominal sternites brownish black, their central portion extensively obscure yellow.

Female.—Length about 10 mm.; wing 12·5 mm.

Rostrum black, sparsely pruinose, about one-third the remainder of head; palpi black. Antennæ black throughout; flagellar segments (female) moderately produced, the abrupt apical pedicles yellow; terminal segment about one-third longer than the penultimate. Head light grey, the anterior vertex more infuscated; anterior vertex about equal in width to the diameter of scape.

Pronotum dark brown. Mesonotal præscutum with disk reddish brown, patterned with darker brown, the usual stripes more or less confluent, the median one ending as a still darker area some distance before suture; lateral borders of præscutum more greyish; posterior sclerites of notum chiefly pale grey, the scutal lobes with darkened centres; mediotergite with a scarcely indicated darkened median vitta. Pleura grey, with a broad and conspicuous longitudinal brownish-black stripe extending from the pronotum across the dorsal pleurites and dorsopleural membrane to just before the root of the halteres on the pleurotergite; sternopleurite not darkened. Halteres yellow, the knobs infuscated. Legs with the coxæ greyish yellow pollinose; trochanters osbcure yellow; femora brownish yellow with a narrow, virtually terminal, dark brown ring; tibiæ obscure yellow, the tips even more narrowly blackened; tarsi obscure yellow, the terminal two segments black. Wings whitish subhyaline, with an abundant spotted and dotted brown pattern; the larger brown spots are distributed as follows: before mid-legnth of cell *C*; origin and fork of *Rs*; Sc_1 and Sc_2; still smaller spots at R_2 and the free tip of Sc_2, *m–cu*, and at ends of all longitudinal veins; darkened dots in virtually all cells, those of the cephalic third more free; stigmal area scarcely evident, yellow, its outer end delimited by the brown spots at R_2 and the free tip of Sc_2; veins yellow, darker in the clouded areas. Venation: *Sc* long, Sc_1 ending about opposite three-fourths to four-fifths the length of the long *Rs*, Sc_2 some distance from its tip, at near mid-distance to the origin of *Rs*; *m–cu* approximately one-half its length before the fork of *M*; cell *1st* M_2 about as long as vein M_{1+2} beyond it.

Abdominal tergites brown, sparsely pruinose; sternites brownish black, the central portions extensively obscure yellow; terminal segments, including genital shield, obscure orange. Ovipositor with valves horn-colour; cerci slender and slightly upcurved.

Hab. Peru (Junin).

Holotype, ♀, Huasahuasi, Tarma, altitude 2800 metres, April 7, 1940 (*Woytkowski*).

Limonia (*Rhipidia*) *nobilissima* is the largest species of the subgenus so far described. It is entirely distinct from the only other very large regional species, *L.* (*R.*) *stonei* Alexander, of Colombia, differing in all details of coloration of the body and wings.

Limonia (*Rhipidia*) *myriosticta*, sp. n.

General coloration brownish grey, the mesonotum patterned with brown; antennæ usually long-bipectinate for the female sex, with flagellar segments three to nine, inclusive, each bearing two branches that exceed the segments in length; femora pale brownish yellow, the

narrow tips clearer yellow; tibiæ and tarsi light yellow; wings pale yellow with a heavy and abundant spotted and dotted brown pattern, the dots unusually numerous; *Sc* long; *m–cu* at or shortly beyond the fork of *M*; abdominal tergites light brown, bordered laterally and caudally with darker brown.

Female.—Length about 6·5–6·7 mm.; wing 7–7·4 mm.

Rostrum and palpi black. Antennæ unusually long-bipectinate for the female sex; scape, pedicel, basal enlargements and branches of flagellar segments, and the entire terminal segment dark brown; pedicels of flagellar segments and all of segments twelve and thirteen white; flagellar segments one and two simply unipectinate, the latter with a longer branch; flagellar segments three to nine, inclusive, with long branches that exceed the segments in length; flagellar segments ten and eleven each with a short simple projection, the latter shortest; terminal segment nearly one-half longer than the penultimate, narrowed outwardly. Head dark grey, the anterior vertex reduced to a linear strip.

Pronotum dark brown. Mesonotum brownish grey, the præscutum patterned with brown, appearing as three capillary central vittæ on anterior half, on the posterior half widely expanded to involve most of the disk; scutal lobes with darkened centres; scutellum and mediotergite greyish pruinose with a capillary dark brown median vitta. Pleura chiefly greyish brown, the ventral sternopleurite whitened, bordered above by a slightly darker brown longitudinal line, with a second somewhat similar line across the ventral anepisternum. Halteres brownish yellow. Legs with the coxæ darkened basally, their tips pale; trochanters yellow; femora pale brownish yellow, the narrow tips clearer yellow; tibiæ and tarsi light yellow, only the terminal tarsal segments dark brown. Wings with the ground-colour pale yellow, the prearcular field somewhat more intensely so; a very heavy brown spotted and dotted pattern, including major darker bown spots in bases of cells *R* and *M*, at supernumerary cross-vein in cell *Sc*, origin of *Rs*, along cord and outer end of cell 1st M_2, R_2 and adjoining portions of the radial veins behind it; all cells of wing abundantly dotted with paler brown specks; veins yellow, brownish black in the major patterned areas. Venation: *Sc* long, Sc_1 ending near two-thirds to three-fourths the length of *Rs*, Sc_2 near its tip; a supernumerary cross-vein in cell *Sc* at near mid-distance between arculus and origin of *Rs*; *Rs* long, angulated at origin; cell *1st* M_2 longer than vein M_{1+2} beyond it; *m–cu* at or shortly beyond the fork of *M*.

Abdominal tergites light brown, the lateral, and especially the posterior borders of the segments, margined with darker brown; sternites obscure brownish yellow, with the posterior borders darker brown; genital segment brownish yellow; cerci slender, strongly upcurved, horn-yellow.

Hab. Peru (Junin); Ecuador (Oriente).

Holotype, ♀, Satipo, Jauja, Peru, altitude 800–900 metres, July 16, 1940 (*Paprzycki*). *Paratype*, ♀, Abitagua, Ecuador, altitude 1800 metres, April 15, 1940 (*MacIntyre*).

Limonia (*Rhipidia*) *myriosticta* has the abundantly dotted wing-pattern much as in *L.* (*R.*) *cramptoni* Alexander, of north-eastern Brazil, and *L.* (*R.*) *microsticta* Alexander, of northern Argentina and south-eastern Brazil, but in all other respects is a very different fly. The unusual development of the flagellar branches in the female sex is noteworthy.

Limonia (*Rhipidia*) *invaripennis*, sp. n. (Fig. 8.)

Size large (wing, male, 9 mm. or more); general coloration buffy to grey, the præscutum with a dark median stripe; antennæ of male elongate, with ten segments bearing two very long branches, in addition to a small basal stub or spur; wings with dark pattern very reduced; male hypopygium with the rostral prolongation a conspicuous flattened blade, the rostral spines arising close together from near mid-length on the face of the blade; mesal apical lobe of gonapophysis elongate, constricted at near mid-length.

Male.—Length about 9·5–10 mm.; wing 8–10·5 mm.; antenna about 4–4·2 mm.

Female.—Length about 8·5–9 mm.; wing 9–10 mm.; antenna about 2 mm.

Rostrum and palpi black. Antennæ of male elongate, as shown by the measurements, with ten unequally tripectinate segments, the shortest branch a mere basal spur; first flagellar segment with a single long branch that is subequal in length to the pedicel of the segment; flagellar segments two to eleven, inclusive, tripectinate, as mentioned, the longest branches about three times the segments, the short spur less than the basal enlargement; terminal segment elongate, about one-half longer than the penultimate; antennæ and branches black, the pedicels whitened; antennæ of female short, simply serrate, the flagellar segments with a slight basal projection that is shorter than the apical pedicel; terminal segment nearly twice the penultimate. Head dark brownish grey; anterior vertex narrow, in male reduced to a linear strip that is about equal to the width of a single ommatidium, in female slightly wider.

Pronotum brownish grey, the posterior portion more buffy. Mesonotal præscutum ranging from buffy to grey, with a conspicuous dark brown central stripe that is wider in front; in some specimens this stripe paler and interrupted by dark lines; lateral stripes lacking; posterior sclerites of notum dark brownish grey, the scutellum paler. Pleura brownish grey, narrowly striped longitudinally with blackened lines, the more dorsal one longer. Halteres brownish black, the base of stem yellow; in cases, stem entirely yellow, knob dark brown. Legs with the coxæ yellow, more or less darkened basally, especially the fore pair; trochanters yellow; fore femora dark brown, the bases yellow; middle and posterior femora obscure yellow or brownish yellow with the tips more narrowly darkened; tibiæ and tarsi dark brown. Wings with a greyish tinge, the dark pattern much reduced, the stigma most evident, appearing as a slightly darkened ring with the centre pale; cells *C* and *Sc* a trifle darker than the ground; cord and outer end of cell 1st M_2 narrowly seamed with darker, more evident in female; veins brown. Venation: *Sc* long, Sc_1 ending about opposite two-thirds the length of *Rs*, Sc_2 at its tip; *m–cu* close to fork of *M*.

Abdomen of male somewhat elongate; tergites brown, the caudal borders narrowly darker brown to brownish black; sternites more obscure yellow, the incisures narrowly darkened; outer segments and hypopygium brownish black. Male hypopygium (fig. 8) with the tergite, *9t*, transverse, narrowed apically, the posterior border gently emarginate. Basistyle, *b*, with the ventromesal lobe relatively stout, bifid, the smaller arm or tubercle bearing a strong seta, the major lobe with a row of five or six similar tubercles with long setæ. Dorsal dististyle slender, the tip acute. Ventral dististyle, *vd*, dark coloured, relatively small, with a very large and conspicuous rostral prolongation, shaped as a yellow flattened blade, the tip acute; rostral spines placed close together at base of prolongation, lying in a shallow depression at near mid-length of blade. Gonapophyses, *g*, with mesal-apical lobe elongate, constricted at near mid-length. Anal tube terminating in two fleshy lobes or papillæ.

Hab. Peru (Junin).

Holotype, ♂, Huasahuasi, Tarma, altitude 2800 metres, April 15, 1940 (*Woytkowski*). *Allotopotype*, ♀, pinned with type. *Paratopotypes*, 10 ♂♀, April 15-25, 1940.

In the unequally tripectinate flagellar segments of the male sex, the present fly agrees most nearly with *Limonia* (*Rhipidia*) *inæquipectinata* Alexander, of northern Argentina, and *L.* (*R.*) *tripectinata* Alexander, of Colombia, differing from both in the large size, almost unpatterned wings, and especially in the somewhat remarkable male hypopygium.

Limonia (*Rhipidia*) *invaripennis carpapatæ*, subsp. n.

Male.—Length about 7·5 mm.; wing 8 mm.; antenna about 3·8 mm.

Characters as in the typical form, differing especially in the smaller size, more heavily patterned wings, and especially in the structure of the male hypopygium.

Wings with darkened clouds at origin of *Rs*, fork of *Sc*, along cord and outer end of cell *1st* M_2, and as heavy central washes in the outer radial and medial cells; stigma with central area pale, as in the typical form. Male hypopygium of the same general type as the typical form, but with all structures slightly modified. Ventromesal lobe of basistyle very narrow, only about one-half as thick as in typical *invaripennis*, gradually narrowed to the simple pointed apex. Rostral prolongation even more flattened, the outer portion forming an even stronger angle, the total length of blade longer. Gonapophyses with mesal-apical lobes darkened and very narrow. Apical lobes of anal tube much stouter, strongly darkened.

Hab. Peru (Junin).

Holotype, ♂, Carpapata, Tarma, altitude 2600 metres, May 3, 1940 (*Woytkowski*).

Limonia (*Rhipidia*) *profana*, sp. n. (Fig, 9,)

Antennæ (male) with ten bipectinate flagellar segments; general coloration of mesonotum obscure brownish yellow, the præscutum with four darker brown stripes; scutellum and mediotergite dark; pleura pale greyish brown, striped longitudinally with black; halteres dusky; femora brown, paler basally, all tarsi dark; wings with a heavy brown pattern, including five major costal areas; Sc_1 ending at near two-thirds the length of *Rs*; abdominal tergites dark brown, sternites bicoloured, yellow with conspicuously darkened posterior borders; male hypopygium with the lobe of basistyle a simple blackened club, expanded distally.

Male.—Length about 9 mm.; wing 10 mm.; antenna about 2·6–2·9 mm.

Female.—Length about 7 mm.; wing 8 mm.

Rostrum and palpi black. Antennæ black, including the basal four segments and all branches; apical pedicels of remaining branched segments white; in male, flagellar segments two to eleven, inclusive, each with two long branches, the longest nearly three times the segments; first flagellar segment with a single stout spur; penultimate segment with branches slightly exceeding the segments; terminal segment simple, longer than the penultimate; in female, all flagellar segments excepting the last with a single strong spur that is shorter than the segment itself. Head dark grey; eyes of male contiguous on vertex.

Mesoonotal præscutum with the ground-colour obscure brownish yellow, with four darker brown stripes, the intermediate pair only narrowly separated medially; lateral stripes incurved at their anterior ends, isolating the posterior interspaces from the remainder of ground; scutum dark brown, the anterior portion of median area restrictedly paler; scutellum dark brown, in cases with a scarcely indicated median pale line; mediotergite brownish black. Pleura pale greyish brown, striped longitudinally with black, the dorsal stripe broader and more conspicuous, extending from the cervical region to the base of abdomen; ventral stripe poorly differentiated, occupying the sternopleurite. Halteres dusky, the extreme base of stem yellow. Legs with coxæ and trochanters yellow, the fore coxæ dark brown on more than the basal half; femora obscure yellow basally, passing into brown, the tip not abruptly blackened; tibiæ and tarsi brownish black. Wings with the ground-colour cream-yellow, chiefly restricted to the interspaces of the cephalic and outer portions, including both sides of the cord; a conspicuous brown pattern, including five major markings along anterior border, these more extensive than the interspaces, the last at stigma; cord and outer end of cell *1st* M_2 similarly seamed with darker; posterior cells of wing almost uniformly suffused with a slightly paler shade of brown; veins brown, yellow in the interspaces of the costal field. Venation: *Sc* long, Sc_1 ending at near two-thirds the length of *Rs*, Sc_2 at its tip; cell *1st* M_2 shorter than vein M_{1+2} beyond it; *m-cu* close to fork of *M*.

Abdominal tergites dark brown; basal sternites light yellow, the posterior borders conspicuously dark brown, the extreme bases of the succeeding segments narrowly darkened. Male hypopygium (fig. 9) with the tergite small, the caudal border convexly rounded. Basistyle, *b*, with a dark-coloured ventromesal lobe that is shaped as a simple club expanded at outer end and here provided with long delicate setæ from very small inconspicuous punctures. Dorsal dististyle long and slender, the tip acute. Ventral dististyle, *vd*, large and fleshy, dark coloured, its area more extensive than that of basistyle;

rostral prolongation small and slender, tipped with two long setæ that exceed the prolongation in length; rostral spines relatively short, placed close together at near mid-length of prolongation, arising from small basal tubercles. Gonapophyses, *g*, with mesal-apical lobes narrowly blackened and pointed at tips.

Hab. Peru (Junin).

Holotype, ♂, Huasahuasi, Tarma, altitude 2800 metres, April 23, 1940 (*Woytkowski*). *Allotopotype*, ♀, with the type. *Paratopotypes*, 1 ♂, 1 ♀, April 12–20, 1940.

Limonia (*Rhipidia*) *profana* is closest to *L.* (*R.*) *succentiva*, sp. n., differing especially in the structure of the male hypopygium, as the simple darkened lobe of the basistyle.

Limonia (*Rhipidia*) *succentiva*, sp. n. (Fig. 10.)

General coloration brown, the præscutum with three darker stripes; antennæ of male with ten flagellar segments that bear two long branches, these about three times as long as the segments; femora brownish yellow, the tips narrowly and abruptly blackened; wings cream-yellow, with five conspicuous brown costal areas; cord and outer end of cell 1*st* M_2 seamed with brown; male hypopygium with the ventromesal lobe irregular in outline, expanded outwardly, at near mid-length bearing a conspicuous finger-like lobe.

Male.—Length about 7·5–8 mm.; wing 9–9·5 mm.; antenna about 3·5 mm.

Female.—Length about 7·5–8 mm.; wing 8·5–10 mm.

Rostrum and palpi black. Antennæ black, the apical pedicels of the flagellar segments white; flagellar segments (male) two to eleven, inclusive, each with two long conspicuous branches, the longest about three times the length of the segment; first flagellar segment with a simple short spur only; penultimate segment with the branches unequal in length, the longest subequal to the segment; terminal segment about as long as the penultimate; in female, flagellar branches simple, a little shorter than the segments. Head dark grey; eyes (male) large, almost contiguous above, the vertex greatly reduced; in female, the vertex only a trifle wider.

Mesonotal præscutum chiefly covered by three brown stripes, the buffy to greyish interspaces indicated behind, the anterior and lateral portions of the sclerite still darker brown; scutal lobes brown, the median area and central portion of scutellum pale; remainder of scutellum and the mediotergite dark. Pleura brown, with a conspicuous black longitudinal stripe across the dorsal sclerites, extending to base of abdomen; ventral sternopleurite less distinctly darkened. Halteres dusky, the base of stem yellow. Legs with coxæ obscure yellow, the bases of the fore and middle pair more infuscated; trochanters obscure yellow; femora obscure yellow to brownish yellow, the tips very narrowly but abruptly blackened, the amount subequal on all legs; tibiæ and tarsi dark brown to black. Wings with the ground-colour cream-yellow, with five conspicuous brown areas, the posterior portion of wing paler brown; fifth dark area at stigma; all dark costal areas well-separated, the second sometimes reduced or even virtually lacking; third and fourth areas, at origin of *Rs* and fork of *Sc*, well separated; distinct brown seams on cord and outer end of cell 1*st* M_2; veins brown, yellow in the costal interspaces. Venation: *Sc* long, Sc_1 ending near three-fourths the length of *Rs*, Sc_2 at its tip; cell 1*st* M_2 shorter than vein M_{1+2} beyond it; *m–cu* close to fork of *M*.

Basal abdominal tergites weakly bicoloured, the bases obscure brownish yellow, the broad apices black; outer tergites more uniformly blackened; sternites more evidently bicoloured, the yellow bases less obscured; hypopygium black. Male hypopygium (fig. 10) with the tergite, 9*t*, narrow, transverse, the caudal margin subtruncate to very gently convex. Basistyle, *b*, with the ventromesal lobe long and conspicuous, dark coloured, at near mid-length bearing a slender finger-like lobe, around base of latter with several strong setæ; apex of lobe produced into three tubercles that bear strong spinous setæ. Dorsal dististyle slender, the tip acute. Ventral dististyle, *vd*, relatively small, dark coloured, its area about equal in extent to the total area of basistyle; rostral prolongation small, relatively short, only a little longer than the rostral spines, these latter placed close together on face of prolongation near base. Gonapophyses, *g*, with mesal-apical lobes of moderate length, the tips acute.

Hab. Peru Junin).

Holotype, ♂ Huasahuasi, Tarma, altitude 2800 metres, April 13, 1940. (*Woytkowski*). *Allotopotype*, ♀, April 24, 1940. *Paratopotypes*, 4 ♂♀, April 21–24, 1940.

Limonia (*Rhipidia*) *succentiva* is closest to *L*. (*R*.) *profana*, sp. n., from which it differs conspicuously in the structure of the male hypopygium. In other regards, the narrowly blackened femoral tips of the present fly, together with the longer antennæ and flagellar branches, provide further characters for separation of the two species.

Limonia (*Rhipidia*) *vafra*, sp. n. (Fig. 11,)

General coloration of the mesonotal præscutum obscure yellow, with three broad, dark brown stripes, the lateral borders further darkened; antennæ (male) with nine bipectinate flagellar segments, the branches relatively short; antennæ (female) with relatively short flagellar branches, the pedicels of the segments white; legs brownish black; wings brown, the costal border variegated with darker brown and pale, the latter areas much smaller than the former; male hypopygium with the lobe of basistyle stout on basal half, the distal portion abruptly narrowed; rostral prolongation of ventral dististyle long and slender, the two spines at base of prolongation.

Male.—Length about 6–7 mm.; wing 6–8 mm.; antenna about 2–2·3 mm.

Female.—Length about 5·5–6 mm.; wing 6·5–6·8 mm.; antenna about 1·5 mm.

Rostrum and palpi black. Antennæ relatively short, in male with nine bipectinate segments; first flagellar segment with a simple lobe only; flagellar segments two to ten, inclusive, each with two relatively short branches, the longest about twice the segment or slightly less; antepenultimate segment with branches unequal in length, one being much shorter; apical segment simple and only a little longer than the penultimate; basal enlargements and branches of segments black, the pedicels white to brownish white. In female, antennæ merely pectinate, the flagellar segments excepting the last produced into a lobe that is about equal in length to the basal swelling itself, on the outer segments even smaller; basal enlargements black, the apical pedicels white to brownish white; both the branches and apical pedicels longer than in the corresponding sex of *variicosta*, which moreover has the apical pedicels blackened like the basal enlargements. Head dark grey; anterior vertex in male reduced to a linear strip that is subequal in width to about a single row of ommatidia; in female, anterior vertex a trifle wider though still narrow.

Pronotum brownish black. Mesonotal præscutum with the ground obscure yellow or brownish yellow, with three broad dark brown stripes, the median one especially wide, restricting the posterior interspaces to narrow lines; lateral and cephalic præscutal margins similarly infuscated; scutal lobes dark brown, the median area obscure yellow, the colour narrowly produced on to the central portion of scutellum, which is otherwise dark brown; postnotum dark brown. Pleura brown above, yellow on ventral portion, with two black longitudinal stripes, the dorsal one broad, extending from the cervical region to the base of abdomen, the ventral stripe very narrow, occupying the sternopleurite and continued above the mid-coxæ on to the meron. Halteres blackened, base of stem narrowly yellow. Legs with coxæ yellow, the fore pair darkened on basal portion; trochanters yellow; remainder of legs brownish black to black, the femoral bases restrictedly brightened. Wings of male with the ground-colour brown, the costal border with five major darker brown areas that are separated by much narrower pale markings; cord and outer end of cell *1st* M_2 more or less distinctly bordered by darker brown; third costal darkening (at origin of *Rs*), separated from the fourth (at fork of *Sc*); veins dark brown, paler in the whitened costal interspaces. In female, the dark posterior portion of wing is more variegated with pale areas, including the centre of cell *1st* M_2, before cord and beyond outer end of cell *1st* M_2, and in outer end of cell *1st A*. Venation: *Sc* long, Sc_1 ending about opposite one-half to two-thirds the length of *Rs*, Sc_2 at its tip; cell *1st* M_2 rectangular; *m–cu* close to fork of *M*.

Abdominal tergites dark brown, the posterior borders of segments and the hypopygium brownish black; in cases, tergites uniformly brownish black to black; sternites light yellow, the posterior borders broadly infuscated, the outer segments uniformly darkened. Male hypopygium (fig. 11) with the tergite, *9t*, narrow, its median caudal portion ill-delimited. Basistyle, *b*, and its lobe dark coloured, the latter stout on basal half, the distal portion produced into a much more slender lobe that is provided with numerous small setæ. Dorsal dististyle slender, its tip acute. Ventral dististyle, *vd*, relatively small, its total area subequal to that of basistyle, the rostral prolongation long and slender, with the two spines placed at extreme base; spines subequal in length, placed close together, arising from small separate tubercles; apex of prolongation bearing two very strong setæ. Mesal-apical lobe of gonapophysis, *g*, gently curved, blackened.

Hab. Peru (Junin).

Holotype, ♂, Carpapata, Tarma, altitude 2600 metres, May 6, 1940 (*Woytkowski*). *Allotopotype*, ♀, May 1, 1940. *Paratopotypes*, 6 ♂♀, May 1–15, 1940; *paratypes*, 2 ♂♂, Huasahuasi, altitude 2800 metres, April 20, 1940 (*Woytkowski*).

The most similar species is *Limonia* (*Rhipidia*) *variicosta* Alexander, of northern Panama, which is still known to me only in the female sex. This latter differs from the same sex of the present fly in details of coloration and in the structure and coloration of the antennæ, as described above.

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XXX.—*On* Curculionidæ (*Col.*) *from Burma.*

By Sir Guy A. K. Marshall, F.R.S.

During his expedition to Burma in 1934, Dr. R. Malaise, of the Stockholm Museum, collected a considerable number of weevils, which he kindly entrusted to me for identification. In the present instalment only the subfamilies Brachyderinæ, Otiorrhynchinæ, Eremninæ and Sitoninæ are dealt with.

The Curculionid fauna of Burma is extraordinarily rich, and although a good many species have already been described from that country, of the 43 dealt with in this paper no less than 23 proved to be new to science; and of these more than half were taken in a single locality —Kambaiti; but there are also 14 species represented by single specimens which cannot be identified.

The types of all the new species will be found in the Stockholm Museum, with the exception of that of *Crinorrhinus strabo*, which is in the British Museum; and Dr. Malaise has kindly allowed cotypes of all the other species to be retained for the latter Museum.

Subfamily *Brachyderinæ.*

Blosyrus oniscus Oliv.—1 ♀, Punkaung, between Sadon and Myitkyina, N.E. Burma, vii. 1934.

Blosyrus asellus Oliv.—1 ♀, S. end of Inle Lake, 900 m., S. Shan States, ix. 1934.

Blosyrodes quadrinodosus Jek.—1 ♀, Kambaiti, 2000 m., N.E. Burma, v. 1934.

Dermatoxenus marmoreus, sp. n.

♂♀. Derm black, with grey scaling, the elytra with irregular whitish patches interspersed with bare black patches and shiny black granules.

Head somewhat transverse but longer than usual, with a broad shallow impression across the vertex, the distance from the eyes to the impression being nearly as long as an eye, with dense scaling (except on the middle line) and sparse minute granules; forehead flat, with a short deep median stria which continues to the vertex in the form of an obsolete carina; eyes very convex, subconical, highest behind the middle. *Rostrum* separated laterally from the head by a deep sulcus which is broadly interrupted in the middle, comparatively narrow, longer than broad, parallel-sided in the basal half and moderately widened at the genæ, very shallowly impressed in the middle, with a low median carina and an obsolescent oblique carina on each side of it; the epistome almost flat, with its lateral angles projecting forwards in a sharp point. *Antennæ* slender, elongate, red-brown, bare except for scaling on the apex of the scape; funicle with joint 2 much longer than 1, which is only slightly longer than 3, the distal joints elongate and clavate. *Prothorax* nearly as long as broad in ♂, a little broader in ♀, almost parallel-sided from the base to far beyond the middle, then narrowing slightly with a curve to the apex; dorsum uneven, with sparse shiny black granules and an almost bare, very shallow broad median sulcus. *Elytra* narrowly ovate in ♂, broader in ♀, regularly rounded laterally, widest at the middle; the striæ so irregular as to be practically obliterated, the large punctures mostly filled with scaling, and with numerous large irregular shiny granules, some of which are transverse; the setæ minute and recumbent. *Legs* long and slender, with dense grey scaling and small flattened black granules; corbels of hind tibiæ bare inside; joint 2 of the hind tarsi a little longer than broad.

Length 8·5–9·5 mm., breadth 3·5–4·5 mm.

N.E. Burma: Kambaiti, 2000 m., 7 ♂♂, 2 ♀♀, iv., v. 1934; Sadon, 4000 ft., 1 ♂, vi.–vii. 1934.

A very distinct species, differing from its other Indian congeners not only in its colouring, but also in the confused coarse punctures on the elytra, the acute processes of the epistome and the bare antennæ.

Tanymecus verlorenii Voll.—7 ♂♂, 7 ♀♀, S. end of Inle Lake, 900 m., S. Shan States, ix. 1934 ; 2 ♀♀, Moulmein, xi. 1934.

Hypomeces squamosus F. var. *pulverulentus* F.—6 ♂♂, 6 ♀♀, Myitkyina, 175 m., iii. 1934 ; 2 ♂♂, Washaung, 200 m., 20 km. from Myitkyina, vii. 1934 ; 2 ♂♂, Sadon, 1200 m., v.–vii. 1934.

Lepropus flavovittatus Pasc.—1 ♂, Punkaung, between Sadon and Myitkyina, N.E. Burma, viii. 1934.

Lepropus lateralis F.—3 ex., Sadon, 1200 m., vi.–vii. 1934 ; 3, Washaung, 200 m., 20 km. E. of Myitkyina, viii. 1934 ; 20, S. end of Inle Lake, 900 m., S. Shan States, ix. 1934 ; 5, Taunggyi, 1500 m., viii.-x. 1934 ; 15. Pekkong, 900 m., x. 1934 ; 1, Sukli, 600 m., 75 km., E. of Moulmein, x. 1934 ; 3, Mekane, 200 m., 90 km. E. of Moulmein, xi. 1934 ; 8, Medaw, Siam, xi. 1934.

Genus SYMPIEZOMIAS Fst.

In his valuable revision of the genera of Brachyderinæ (Stett. ent. Zeit. xcvii. 1936, p. 231) Dr. F. van Emden has sunk this genus as a synonym of the African *Iphisomus* Gerst., but this view I am unable to accept. *Sympiezomias*, as at present constituted, is certainly a composite genus, and the typical forms (the genotype being the Chinese *S. velatus* Chev.) never present the striking facies characteristic of *Iphisomus*, with its inflated front femora and apparently persistent hairy mandibular appendages ; moreover, in the latter the epistome is quite undefined and joint 2 of the funicle as long as 1, whereas in *Sympiezomias* the epistome is well marked and joint 2 of the funicle is shorter than 1. It seems better, therefore, to maintain the two genera as distinct, at least for the present.

A review of the Oriental species shows that they fall into three homogeneous groups, which may be regarded as of generic significance, and they can be distinguished as follows :—

1 (2). Scutellum distinct ; elytra with humeral fold ; hind tibiæ never denticulate ; epistome quite undefined, mentum with only two setæ ; intercoxal process of venter narrower, arcuate or angulate, suture between ventrites 1 and 2 distinct throughout, ventrite 2 much longer than $3+4$ .... *Indomias*, gen. nov.

2 (1). Scutellum concealed ; elytra without any humeral fold ; hind tibiæ denticulate internally on apical half ; epistome well defined, with a sulcus on each side of it.

3 (4). Mentum with 4–6 setæ ; intercoxal process of venter narrower, arcuate or angulate, suture between ventrites 1 and 2 distinct throughout, ventrite 2 much longer than $3+4$ in the middle ; funicle with joint 1 normally longer than 2.... *Sympiezomias* Fst.

4 (3). Mentum with only 2 setæ ; intercoxal process of venter broader and truncate, suture between ventrites 1 and 2 more or less obliterated in the middle, ventrite 2 not or only slightly longer than $3+4$; funicle with the two basal joints equal. *Burmotragus*, gen. nov

As thus restricted, *Sympiezomias* does not occur in peninsular India or Ceylon, but ranges through Burma, China and Japan. Of the species described in the ' Fauna of British India ' (Col. Curc., pt. 1, 1916, p. 159) only *serratipes* Mshl. belongs to this genus.

It may be noted that two of the species listed under *Sympiezomias* in the Coleopt. Catal. (pt. 131) should be transferred to *Geotragus*, viz. *inflatus* Fst. and *setosus* Aur.

Sympiezomias subvirens, sp. n.

♂. Derm black, with dense blue-green scales mingled with pale yellowish ones, the latter having usually a coppery reflection.

Head with dense fine punctation and a deep median sulcus, which extends behind the eyes. *Rostrum* longer than broad, with a wide deep dorsal depression containing a deep median sulcus which is broad at its apex and narrows behind, the depression bounded on each side by a sharp carina, these carinæ converging posteriorly, a deep stria adjoining them exteriorly, and the dorsal margin obtusely costate ; the upper edge of the scrobe not curving downwards as usual but ceasing rather abruptly in front of the middle of the eye, there being a deep longitudinal depression between it and the eye, so that when viewed from above the sides of the rostrum are distinctly sinuate near the base. *Antennæ* stout, black; joint 1 of the funicle much longer than 2, the distal joints slightly transverse. *Prothorax* transverse (6 : 7), strongly rounded laterally, widest at one-third from the base, which is distinctly marginate and much wider than the apex; the dorsum only slightly convex longitudinally in the middle, with a very shallow transverse impression near the apex, rugosely punctate, the intervals bearing obtuse granules that are mostly covered with scaling, with a narrow median sulcus on the anterior half. *Elytra* broadly ovate, strongly and regularly rounded laterally, widest at the middle, without any trace of a humeral fold, marginate throughout at the base, the apices narrowly separated but without any mucros; the dorsal outline moderately convex, highest at one-third from the base, the posterior declivity steep and not impressed; the fine striæ with close punctures which are almost entirely hidden by scaling; the intervals broad and flat, of equal height, with numerous irregular small inconspicuous scale-like setæ, which become much longer and erect only near the apex, especially on intervals 1–3. *Legs* with dense scaling as on the elytra; hind tibiæ finely denticulate on the apical half, the front pair moderately curved inwards at the apex.

Length 7·8–8·0 mm., breadth 3·5–3·6 mm.

BURMA: S. Shan States, S. end of Inle Lake, 2 ♂♂, ix. 1934.

Allied to *serratipes* Mshl., 1916, which differs in lacking the lateral sinuation of the rostrum and the deep anteocular depression; the elytra are more produced backwards at the apex so that the declivity is much less steep and bears no erect setæ, the front tibiæ are more strongly curved, and the prothorax is of a different shape.

Sympiezomias shanensis, sp. n.

♂♀. Derm black, with dense grey scaling (usually having a coppery reflection) and a few variable brown spots in the striæ on the elytra.

Head with longitudinally confluent punctation (hidden by scaling) and a deep median sulcus which ascends to the vertex. *Rostrum* longer than broad, almost flat dorsally, with a deep parallel-sided median sulcus, the sublateral carinæ converging behind, the lateral stria shallow, and the margin subcarinate; the ante-ocular depression shallow. *Antennæ* black, with the basal half of the scape red-brown; funicle with the two basal joints subequal, the distal joints longer than broad. *Prothorax* nearly as long as broad (♂) or slightly broader (♀), rounded laterally, widest at the middle, marginate at the base, which is wider than the apex; the dorsum almost flat longitudinally, rugose, the low squamose granules usually bearing a small black spot, the median sulcus very shallow, often interrupted and sometimes obsolescent. *Elytra* broadly ovate, only slightly wider in ♀, in which the sides are almost parallel in the middle, without any humeral fold, marginate throughout at the base, the apices dehiscent but not mucronate, the apical area slightly more acuminate in ♀; the dorsal outline moderately convex, highest at one-third from the base, the declivity not impressed and a little steeper in ♀, in which the apex is not produced downwards; the well-marked striæ with large round separated punctures, which diminish greatly behind but are conspicuous through the scaling on the basal half; the intervals broad and convex, with numerous irregular small subrecumbent setæ, which are never erect on the declivity. *Legs* with dense grey scaling; hind tibiæ sharply denticulate on the apical half, the front pair moderately curved at the apex.

Length 6·7–8·5 mm., breadth 3·0–3·6 mm.

Burma: S. Shan States, Taunggyi, 1500 m., 4 ♂♂, 5 ♀♀, viii.–ix. 1934.

Allied to the preceding species and *serratipes* Mshl., but differing from them both in the longer second funicular joint, the more rugose pronotum, the large punctures on the elytra, and the convex intervals.

Genus Indomias, nov.

The characters given in the key above sufficiently distinguish this new genus, of which *Sympiezomias prasinus* Boh., 1845, is the genotype. All the species described under *Sympiezomias* in the Faun. Brit. Ind. (*t. c.*, belong to this genus except *serratipes* Mshl., *metallescen* Mshl., and *similis* Mshl.

Up to the present the genus is not known to occur outside of peninsular India and Ceylon.

Genus BURMOTRAGUS, nov.

Genotype : *Sympiezomias metallescens* Mshl., 1916.

In addition to the characters given in the key above the species of this genus differ from those of the two other genera in their more elongate facies, due to the greater prolongation of the apical area of the elytra (*cf.* Faun. Brit. Ind., *t. c.*, figs. 51, 53), and they more resemble in general form species of *Geotragus* Schönh.

The only other described species to be included in this genus is *Sympiezomias similis* Mshl., 1916, from Assam, the four remaining species being confined to Burma.

Burmotragus malaisei, sp. n.

♂♀. Derm black, with dense scaling, but apparently easily abraded; head and prothorax dorsally grey to grey-brown, turning to pale metallic green laterally ;/ elytra grey to grey-brown dorsally as far as stria 4 from base to apex, usually with a few green scales in the punctures, the lateral areas metallic green to brassy with an intrusion of grey or brown scales about the middle, the limits of the colour not being sharply defined; underside green.

Head with the shallow punctures longitudinally confluent and a few flattened shiny granules, the deep median stria continued behind the eyes. *Rostrum* much longer than broad (5 : 4), shallowly sinuate laterally, almost flat dorsally, with rugose shallow punctures, a deep median sulcus and a very indefinite sinuous oblique carina on each side of it. *Prothorax* as long as broad, gently rounded laterally, widest at the middle, not constricted at the apex, which is a little narrower than the shallowly sinuate base ; the dorsum moderately convex longitudinally, highest at the middle, set with separated round shiny granules, the interstices densely squamose, with a rather irregular shallow median sulcus. *Elytra* narrowly ovate in ♂, slightly broader in ♀, the apex slightly produced downwards in ♀ and rather more acuminate than in ♂; the dorsal outline moderately convex, highest at about the middle; the shallow striæ with large round punctures, which become much smaller behind, the punctures entirely covered with scales but not concealed by them; the intervals on the basal half when bare narrower than the large punctures, but appearing broader when covered with scales, somewhat convex; interval 3 slightly higher than the others, with a rather higher dilatation behind the middle followed by a depression, and then an elongate obtuse tubercle at the top of the declivity, and a short costa at the apical junction of intervals 3 and 9, each interval with a row of short pale subrecumbent spatulate setæ. *Legs* red-brown, with rather dense, partly metallic pale scales, the tarsi more or less blackish; hind tibiæ sharply denticulate on the apical half. *Underside* of ♂ specially characterized by a stripe of numerous long recumbent setæ down the middle of ventrites 1 and 2.

Length 6·3–8·5 mm., breadth 2·0–3·5 mm.

N.E. Burma: Sadon, 1200 m., 6 ♂♂, 9 ♀♀, vi.–vii. 1934.

Allied to *metallescens* Mshl., which differs in having no flattened granules on the forehead; interval 3 on the elytra is not raised, nor are there any tubercles at the top of the declivity; and the ventral stripe of long setæ is lacking in the ♂.

Burmotragus affinis, sp. n.

♂♀. Very closely allied to *B. malaisei*, sp. n., the description of which applies to it except in the following particulars:—*Prothorax* with the granules somewhat larger and closer, the median sulcus being shallower and less distinct. *Elytra* with interval 3 simply costate posteriorly, without any tubercle. *Underside* of ♂ without any trace of the strip of long dense recumbent setæ in the middle of the two basal ventrites.

Length 6·5–9·0, breadth 2·2–3·5 mm.

N.E. Burma: Kambaiti, 2000 m., 9 ♂♂, 3 ♀♀, v. 1934.

Burmotragus excisiventris, sp. n.

♂♀. Derm shiny black to red-brown, with dense brown scaling that is almost unicolorous.

Head longitudinally rugulose and with numerous flattened granules, the median furrow narrow and not exceeding the eyes. *Rostrum* much longer than broad, shallowly sinuate laterally, almost flat dorsally, strongly rugose longitudinally, with a deep median sulcus, but without definite sublateral carinæ. *Prothorax* as long as broad, moderately rounded laterally, widest at the middle, scarcely constricted near the apex, which is slightly narrower than the base; the dorsum strongly convex longitudinally, highest at the middle, set with numerous small separated shiny granules, the interstices rugosely punctate and densely squamose, the median sulcus broad and deep. *Elytra* rather broadly ovate, moderately rounded laterally, widest at about the middle, the apical area obtusely acuminate in ♂, rather more sharply so in ♀, but the shape of the elytra otherwise very similar in the two sexes; the dorsal outline strongly convex, highest before the middle, the posterior declivity only slightly curved; the shallow striæ with large round punctures which are greatly reduced behind, the larger punctures when bare as broad as the intervals, but when normally covered with scaling appearing narrower; intervals convex, 3 subcostate and with two obtuse elevations at the top of the declivity, 5 subcostate behind the middle only, the costa at the apex of 9 less raised than in *malaisei*; the subrecumbent pale setæ short on the disk, becoming longer and more spatulate at the apex. *Legs* red-brown, with dense brown scaling, the tarsi blackish; hind tibiæ rather feebly denticulate. *Underside* of ♂ evenly set with sparse short setæ; ventrite 4 of ♀ very abnormal, having a deep semicircular excision on its apical margin, the angles of which project very sharply.

Length 7·5–10·5 mm., breadth 3·0–4·2 mm.

N.E. Burma: Punkaung, between Sadon and Myitkyina, 1 ♂, 1 ♀, vii. 1934 (type); Sadon, 1200 m., 2 ♂♂, 2 ♀♀, vi.–vii. 1934.

Allied to *similis* Mshl., from Assam, which, apart from its different colouring, may be distinguished by the absence of any granules on the head, the much less rugose rostrum, and the lack of elevations on the elytral declivity. The ♀ may be readily recognized by the unusual structure of the venter.

Subfamily *Otiorrhynchinæ.*

Episomus bicuspis Mshl.—2 ♀♀, Kambaiti, 2000 m., N.E. Burma, vi. 1934.

Episomus guttatus Boh.—2 ♂♂, 1 ♀, S. end of Inle Lake, 900 m., S. Shan States, ix. 1934; 1 ♀, 40 km. E. of Taunggyi, ix.–x , 1934.

Episomus quatuornotatus Desbr.—1 ♂, Sadon, N.E. Burma, 1200 m., vi.–vii. 1934.

Episomus versutus Fst.—1 ♀, Sadon, 1200 m., vi.–vii. 1934.

Episomus humeralis Chevr.—1 ♂, Sadon, 1200 m., vi.–vii. 1934.

Epicalus shanensis, sp. n.

♂♀. Derm red-brown, with dense pale brown and grey scaling; head brown, with a narrow pale ring round the eyes; rostrum entirely grey; prothorax brown dorsally with a narrow pale median line, the lateral margins narrowly pale, this colour extending over the whole of the pleuræ; elytra brown with irregular pale markings and a broad pale band across the top of the declivity; underside uniformly pale.

Head with the forehead flat transversely, wider than the dorsal area of the rostrum, the sculpture entirely concealed by scaling; eyes not projecting, their convexity continuous with that of the head. *Rostrum* as long as broad, parallel-sided, densely squamose throughout, the dorsal area with the margins carinate and parallel, the posterior margin of the subvertical epistome angulate; scrobes short and broad, curving slightly outwards posteriorly. *Antennæ* red-brown, densely squamose; scape curved, widening from base to apex, with erect spatulate setæ; funicle with joint 2 slightly shorter than 1, the rest subequal and transverse. *Prothorax* transverse (4 : 5), gently rounded laterally, widest at the middle, not constricted at the apex, which is a little narrower than the bisinuate base; dorsum flat longitudinally, apparently even, the sculpture being entirely hidden by the dense scaling. *Elytra* separately rounded at the base, parallel-sided in ♂ from the prominent shoulders to beyond the middle, slightly widened behind the middle in ♀; the distinct striæ with the punctures narrowly visible through the scaling; the intervals of equal height, broad, gently convex, each with a row of short suberect spatulate setæ. *Legs* red-brown, with dense grey scaling, the tibiæ with suberect spatulate setæ; femora with a very small sharp tooth in the middle, the median tibiæ strongly curved.

Length 2·0–2·8 mm., breadth 0·8–1·1 mm.

BURMA: S. Shan States, Taunggyi, 1500 m., 1 ♂, 2 ♀♀, viii.–ix. 1934.

When describing the genus *Epicalus* in the 'Fauna of British India' (Col. Curcul. pt. 1, pp. 278, 283), I stated that the anterior tibiæ were serrate externally. This is not the case, the error having been due to the fact that in the single badly-preserved specimen available (a cotype) the curved spatulate setæ were stuck down to the tibiæ, thus producing a denticulate appearance.

Myllocerus striatifrons, sp. n.

♂♀. Derm testaceous brown to red-brown, with not very dense, pale green scaling, leaving variable bare spots on the elytra; underside with sparse green scaling.

Head sparsely squamose, with numerous fine straight striæ separated by narrow carinæ, the forehead twice as wide as the narrowest space between the scrobes; eyes small, convex, prominent, much shorter than the width of the forehead (2 : 3). *Rostrum* as long as broad, narrowing rapidly from the base to the middle and strongly dilated at the genæ, striate dorsally and laterally like the head, the dorsal area not delimited laterally; epistome unusually broad, forming a large shiny subvertical triangular plate, which approaches so close to the margin of the scrobes that the normal overhanging lateral fringe of setæ is confined to the part in front of the antennæ, the lateral margins with a sharp carina, the posterior angle raised well above the dorsal level of the rostrum in lateral view; scrobes short, foveiform, not extending backwards so far as the epistome; mentum with two setæ. *Antennæ* comparatively stout, honey-brown, with the club fuscous, devoid of scaling; scape gradually clavate, rugulose, with erect setæ; joint 1 of the funicle shorter than 2, 3 slightly longer than 4, the distal joints a little longer than broad and clavate. *Prothorax* slightly transverse, feebly rounded laterally at the middle and widest there, shallowly constricted at the base, which is subtruncate and very slightly narrower than the obliquely truncate apex; the dorsum with coarse punctures that are partly visible through the scaling, a median carina on the basal half only, a broad depression on each side of it, and a much shallower one on each side beyond the middle. *Scutellum* bare. *Elytra* obovate, widest behind the middle, broader in ♀, much wider at the rectangularly rounded shoulders than the base of the prothorax, jointly sinuate at the base, very shallowly sinuate behind the shoulders, with a shallow transverse depression not far from the base (more marked in ♀); the striæ distinct, with close deep punctures which are sometimes partly concealed by the small round scales; the intervals slightly convex, the alternate ones with a sparse row of short erect setæ. *Legs* honey-brown, with sparse green scales; femora with a small sharp tooth; tibiæ straight.

Length 2·7–3·5 mm., breadth 1·2–1·5 mm.

N.E. BURMA: Kambaiti, 2000 m., 5 ♂♂, 2 ♀♀, v.–vi. 1934.

In the key to the Indian *Myllocerus* (Faun. Brit. Ind., *t. c.* p. 293) this species runs down to *gracilis* Mshl., which differs *inter alia* in having much larger eyes (as long as the rostrum) and a much shorter rostrum, which is only slightly dilated at the genæ; the space between the scrobes is nearly as broad as the forehead; and the antennæ are much longer and more slender, the distal joints of the funicle elongate, and the setæ on the scape recumbent.

Myllocerus brevirostris, sp. n.

♂♀. Derm black, with rather thin grey scaling (usually with a slight metallic reflection) and large bare patches; head and prothorax with sparse uniform scaling; elytra with variable black patches, including a subbasal one, a very broad one across the top of the declivity, and a smaller one near the apex; underside uniformly grey.

Head broad, deeply striolate, the width of the forehead much greater than the length of an eye; eyes large, about as long as the side of the rostrum, moderately convex, highest much behind the middle. *Rostrum* very short, strongly transverse (5 : 9), parallel-sided, the space between the scrobes very nearly as broad as the forehead; the dorsal area broad, almost flat, finely aciculate (hidden by scaling), with a fine lateral carina; epistome ill-defined, deeply depressed in the middle, rather shallowly sinuate at the apex, and without any carinate margin behind, the epistomal fringe of setæ dense; scrobes small, foveiform, widely distant; mentum unusually immersed in the buccal cavity, apparently bisetose. *Antennæ* very slender, honey-brown, sparsely pubescent, without any scaling; scape gradually clavate apically, with recumbent setæ; funicle with the basal two joints equal or 2 very slightly longer than 1, 3 longer than 4, the distal joints longer than broad and clavate. *Prothorax* unusually short, very transverse (4 : 7), parallel-sided from the apex to two-thirds and then narrowing to the truncate base, the apex vertically truncate laterally; the dorsum sloping downwards from apex to base, with strong close punctures that are scarcely concealed by the sparse scaling, without impressions. *Scutellum* with grey scales. *Elytra* much broader at the roundly rectangular shoulders than the base of the prothorax, parallel-sided from there to the middle (♂) or widening to behind the middle (♀), truncate at the base, without depressions; the striæ distinct, with small close punctures visible through the scaling; the intervals broad, slightly convex, with numerous irregular short curved setæ on all, the small scales oblong. *Legs* blackish, pubescent; femora with a small sharp tooth; tibiæ straight.

Length 2·8–3·1 mm., breadth 1·1–1·5 mm.

N.E. Burma: Sadon, 1200 m., 3 ♂♂, 1 ♀, vi.–vii. 1934 (type); S. Shan States, Taunggyi, 1500 m., 1 ♂, ix. 1934.

A very distinct species on account of its very short and broad rostrum, widely separated scrobes, and very short prothorox.

Myllocerus pubescens Fst.—1 ♂, 1 ♀, Taunggyi, 1500 m., S. Shan States, viii.–ix. 1934.

Subfamily Eremninæ.

Cyphicerus elongatus, sp. n.

♂♀. Derm black, with pale green and black scales; prothorax green above and below, with two irregular broad black dorsal stripes ; elytra dorsally mottled with black and green scales as far as stria 5, the lateral areas uniformly pale green ; underside with dense grey-green scaling.

Head with numerous fine longitudinal carinulæ which are parallel on the forehead and diverge to each side on the vertex, being partly concealed by green and coppery scaling ; forehead flat or shallowly concave, its width equal to (♂) or greater than (♀) the length of an eye. *Rostrum* about as long as its basal width, rapidly narrowing from the base to the antennæ and strongly dilated at the genæ, longitudinally carinulate both dorsally and laterally ; the dorsal area depressed, with a very fine low median carina, and bounded laterally by parallel punctate costæ, the anterior transverse ridge rather ill-defined ; the epistome longer than usual, being much more shallowly excised on its apical margin. *Antennæ* red-brown, the club fuscous ; scape not very stout, subcylindrical, gradually clavate at the apex, with sparse narrow pale scales and short suberect setæ ; funicle with joint 2 a little longer than 1, 3–7 subequal, elongate and clavate ; club narrow, elongate, with the base of joint 3 a little narrower than the apex of 2. *Prothorax* transverse (4 : 5), the sides gently rounded in the middle only, of equal width at base and apex, the former subtruncate, the latter shallowly sinuate in the middle, the postocular lobes very feeble, with only a few short vibrissæ ; the dorsum with large close punctures (partly concealed by scaling), a broad shallow transverse depression at one-fourth from the apex, and a very shallow rounded impression on each side behind the middle on the edge of the green lateral stripe. *Scutellum* longer than broad, suboblong, with green scaling. *Elytra* much narrower and more elongate than usual, especially in ♂, much wider at the rectangularly-rounded shoulders than the base of the prothorax, almost parallel-sided from there to behind the middle in ♂, broader and slightly dilated behind the middle in ♀ ; the striæ with deep close punctures, 5 and 6 parallel at the base ; the intervals broader than the striæ, slightly convex and of equal height, 3 and 5 only with a row of long slender erect setæ (easily broken). *Legs* very slender, black (rarely red-brown) with rather sparse green and grey scaling.

Length 5·0–7·5 mm., breadth 1·6–2·8 mm.

N.E. BURMA : Kambaiti, 2000 m., 7 ♂♂, 1 ♀, vi. 1934.

A well-marked species related to *C. ornatus* Fst., which differs in having no carinulæ on the head and rostrum, the rostrum is less narrowed in the basal half and less dilated apically, the elytra are broader proportionately and all the intervals bear a row of much shorter erect setæ.

Cyphicerus retusifrons, sp. n.

♀. Derm piceous, with dense scaling throughout; head and prothorax brown, the latter with an indefinite paler median stripe; elytra with the lateral areas and the posterior declivity pale brown or greyish brown, with a dark brown patch at the apex of interval 5, the dorsum with a broad ill-defined dark brown transverse band behind the middle, extending to stria 6, and with confluent dark brown patches on the basal half; underside with dense brownish-grey scaling.

Head retuse in front and sloping rather steeply forwards, with the sculpture entirely hidden by scaling; the forehead about as wide as the length of an eye, concave, with a very small median fovea. *Rostrum* a little longer than its basal width, strongly dilated at the genæ and there slightly wider than at the base; the dorsal area comparatively narrow, not wider than the lateral areas (as viewed from above), depressed, with a low narrow median carina, the obtusely costate margins slightly diverging posteriorly, the anterior transverse ridge well defined; the lateral areas not carinulate, but with a broad squamose sulcus running from the upper edge of the scrobe to the eye; the epistome rather small, shallowly emarginate in front, the hind margin carinate and forming an acute angle. *Antennæ* red-brown, the club fuscous; the scape not very stout, cylindrical, gradually clavate at the apex, with pale scaling and stiff suberect setæ; funicle without true scales, joint 2 a little longer than 1, 3 longer than 4, 4 longer than 5, 5–7 subequal, only slightly longer than broad and widening from base to apex; club broadly ovate, the base of joint 3 slightly narrower than the apex of 2. *Prothorax* a little broader than long, the sides gently rounded in the middle only, the base and apex of equal width and both truncate, the postocular lobes well developed, the vibrissæ inconspicuous; the dorsum with close strong punctation which is almost concealed by scaling, and a shallow transverse depression at one-fourth from the apex. *Scutellum* small, subquadrate, with dense grey scales. *Elytra* much wider at the rectangularly-rounded shoulders than the base of the prothorax and slightly dilated behind the middle; the striæ with deep separated punctures, 5 and 6 parallel at the base; the intervals broad, convex, each with a single row of short subrecumbent setæ, 3 and 5 very slightly higher than the others behind the middle. *Legs* red-brown, slender, with rather sparse pale brown scaling.

Length 5·5–6·0 mm., breadth 2·3–2·4 mm.

N.E. Burma: Kambaiti, 2000 m., 3 ♀♀, iv. 1934.

This is the only Indo-Burmese species known to me in which the funicle bears no true scales, and the retuse forehead is also distinctive.

Cyphicerus farinosus Fst.—3 ♂♂, 1 ♀, Taunggyi, 1500 m., S. Shan States, viii.–ix. 1934.

This species, which is not a typical *Cyphiceras*, was described by Faust from Cochin-China, but he associated with it other specimens from Hong Kong. It now seems doubtful whether the two forms are really conspecific; if not, the name *C. bohemani* Reitt. is available for the Chinese species.

Cyphicerus patricius Fst.—1 ♂, Sadon, 1200 m., N.E. Burma, vi.–vii. 1934.

A very aberrant species.

Cyphicerinus undulans, sp. n.

♂♀. Derm piceous to red-brown, with rather thin brown scaling and irregular darker patches on the elytra.

Head finely striolate, with sparse scaling; the forehead wider than the length of an eye, flattened, without any median fovea. *Rostrum* about as long as broad and strongly dilated apically; the dorsal area finely striolate, flat behind, but with a broad median depression which becomes gradually deeper anteriorly and contains a low narrow median carina, the anterior transverse ridge ill-defined; the lateral areas more broadly striolate.

Antennæ red-brown, scape comparatively slender, gradually clavate at the apex, with narrow scales and short subrecumbent setæ; funicle with joint 2 slightly longer than 1, 3 longer than 4, 4–7 subequal, longer than broad, clavate. *Prothorax* transverse (8 : 11), with the sides slightly rounded in the middle, of equal width at base and apex, which are both truncate, the postocular lobes feeble, with a few short vibrissæ; the dorsum with coarse close punctures, a transverse depression at one-third from the apex, and a somewhat flattened area on each side near the base; the scaling sparse, but sometimes forming an indefinite paler median stripe. *Scutellum* suboblong, longer than broad, with sparse narrow scales. *Elytra* much wider than the prothorax at the base and somewhat dilated behind the middle in both sexes, the shoulders roundly rectangular; the shallow striæ with small deep separated punctures, each containing a scale; the intervals flat, except 3 and 5, which are costate, but the costæ broadly interrupted on the basal half by a wide oblique depression running from near the shoulder to the suture at one-fourth from the base, and a low broad elevation near the base between striæ 1 and 5; scales small, subquadrate, contiguous on the pale areas, but separated on the darker patches; the irregular short spatulate subrecumbent setæ occurring only on the alternate intervals. *Legs* rather slender, red-brown, with narrow pale brown scales forming a denser band on the posterior femora.

Length 5·5–6·0 mm., breadth 2·4–2·5 mm.

N.E. BURMA: Kambaiti, 2000 m., 1 ♂, 1 ♀, v.–vi. 1934.

Distinguished from its congeners by the uneven elytra, striolate rostrum, and the absence of a frontal fovea.

Genus ŒDOPHRYS, nov.

Head with the forehead tumid, being more or less strongly convex both transversely and longitudinally, and much wider than an eye; eyes sublateral, broadly ovate, flat or only very slightly convex. *Rostrum* with its sides forming a continuous line with those of the head, broad and more or less transverse, narrowing slightly from the base to the middle and not very strongly dilated at the apex; epistome nearly always asymmetrical (sometimes strongly so), short, not extending behind the antennæ, margined behind by a low obtuse-angled carina; scrobes short, curving inwards posteriorly; the oral aperture very oblique, much longer than the lower surface of the rostrum; mentum with a transverse row of four setæ. *Antennæ* with the scape moderately stout, curved, gradually widening from base to apex, with sparse narrow scales and short, stiff, erect setæ; funicle with joint 2 a little longer than 1 (rarely equal); club regularly fusiform. *Prothorax* transverse, of equal width at base and apex, the base shallowly bisinuate, the notum always with a round depression on each side behind the middle; postocular lobes very feeble or obsolete, with only a few sparse vibrissæ. *Scutellum* always bare. *Elytra* much wider at the rectangularly-rounded shoulders than the prothorax, widest behind the middle in both sexes, longitudinally convex, and jointly-rounded at the apex. *Legs* slender; femora with a small sharp tooth; front tibiæ not sinuate basally on the lower edge, middle pair more or less curved dorsally, hind pair with the corbels entirely open; claws free.

Genotype: *Myllocerus convexifrons* Fst.

Other species referable to this genus are *Myllocerus setarius* Rttr. (China) and *Cyphicerus egenus* Fst. (Burma), and in addition to the two new species described below I know of three others from Burma, but from single specimens only. These eight species form a very homogeneous and distinctive group allied so *Cyrtepistomus* Mshl. The latter genus is distinguished by the structure of the epistome, the hind margin of which forms a broad low curve without any angulation, and the fringe of setæ overlying the epistome, which in allied genera is found along nearly the whole margin, in *Cyrtepistomus* is absent from the hind margin, and confined to the short lateral areas in front of the antennæ. Further, *Cyrtepistomus* has no anterior transverse ridge on the dorsal area of the rostrum or a bare space behind the epistome, the antennal scape never bears stiff erect setæ, and the forehead is not tumid.

Cyphicerus differs from both the above-named genera in having only two setæ on the mentum and in the partly enclosed corbels of the hind tibiæ, which have a distinct bare internal carina.

All the species in the new genus are piceous to red-brown, with dense brown and grey scaling and regular rows of short stiff erect setæ on the elytra.

Œdophrys rudis, sp. n.

♂♀. Scaling generally grey, with very indefinite brownish markings ; head and rostrum brown ; pronotum grey in the middle, brownish laterally ; elytra with the humeral areas and a broad transverse band behind the middle vaguely brownish.

Head less tumid than in the other species, the sculpture entirely hidden by scaling except for a trace of the median stria, and set with short stiff erect setæ. *Rostrum* as long as broad, the dorsal area depressed anteriorly, with three parallel carinæ ; the bare area behind the epistome opaque, shallowly impressed, divided by a short median carina ; the lateral areas with a short bare oblique carina behind the scrobe ; epistome scarcely asymmetrical, but the space between the lateral angle and the epistome narrower on the right side than on the left. *Antennæ* with joint 2 of the funicle a little longer than 1, 5–7 not or but slightly longer than broad, moniliform. *Prothorax* with the two posterior depressions well marked, so that a short longitudinal ridge is formed on the dorso-lateral margin, and a shallow transverse impression on each side in front of the middle ; a few short erect setæ along the front margin, the rest recumbent. *Elytra* broadly ovate in ♀, only slightly narrower in ♂, jointly truncate at the base ; the shallow striæ with close punctures which are visible only as a narrow line when the scaling is intact ; the intervals broad and even, each with a row of short erect spatulate setæ which are broadly truncate at the apex, the length of a seta being not greater than the width of an interval.

Length 3·0–3·7 mm., breadth 1·5–1·8 mm.

N.E. Burma : Kambaiti, 2000 m., 2 ♂♂, 7 ♀♀, iv.–v. 1934.

Allied to the genotype, *C. convexifrons* Fst., which differs in having the forehead more tumid, and the eyes rather larger and flatter ; the rostrum is proportionately broader, with the epistome distinctly asymmetrical, the whole rostrum being shorter on the right side than on the left ; the scape of the antennæ is much more slender ;

the elytra are separately rounded at the base and the setæ on them are much narrower and cylindrical; and the middle tibiæ are more strongly curved.

Œdophrys deludens, sp. n.

♂♀. Very similar in size and facies to the preceding species, but the general colour light brown, with an indefinite common broad V-shaped dark band on the elytra behind the middle.

Agreeing structurally with the description of *O. rudis* except as follows:—*Rostrum* with the mandibles rather more prominent. *Antennæ* with the funicle more slender and the distal joints distinctly longer than broad. *Prothorax* with sparse erect setæ on the disk in addition to those on the front margin. *Elytra* separately rounded at the base, the punctures clearly visible through the scaling, and the setæ longer than the width of the intervals and cylindrical, not spatulate.

Length 3·0–4·0 mm., breadth 1·5–1·8 mm.

Burma: Washaung, 200 m., 20 km. east of Myitkyina, 1 ♂, 1 ♀, vii. 1934.

Œdophrys convexifrons Fst. (*Myllocerus*).—2 ♂♂, 1 ♀, Mekane, 90 km. E. of Moulmein, 200 m., Tenasserim, xi. 1934.

Œdophrys egenus Fst. (*Cyphicerus*).—1 ♀, Malvedaung, 30 km. S. of Ye, 300 m., Tenasserim, xi. 1934.

Cyrtepistomus bardus, sp. n.

♂♀. Derm honey-brown, with almost uniform grey-brown scales, which vary somewhat in size and density on the elytra, giving the appearance of slightly darker markings.

Head with the sculpture hidden by scaling; the forehead flattened, about as wide as the length of an eye, with a median fovea. *Rostrum* about as long as broad, narrowing rapidly from the base to the antennæ and strongly dilated at the apex; the dorsal area flat, densely squamose, with a distinct median carina, its marginal carinæ converging posteriorly; the lateral areas striolate; epistome with its posterior margin obtusely carinate and forming a broad flat curve, its lateral angles projecting forwards more sharply than usual. *Antennæ* honey-brown, long and slender; funicle with joint 2 longer than 1, 3–7 subequal, elongate and clavate; club elongate, with the base of joint 3 narrower than the apex of 2. *Prothorax* transverse (4 : 5), slightly rounded laterally in the middle, the apex as wide as the subtruncate base, the post-ocular lobes feeble, without vibrissæ; the dorsum with a broad saddle-like depression, the base and apex being somewhat raised, with a very shallow depression on each side behind the middle; the coarse punctation almost or quite concealed by the uniform scaling. *Scutellum* oblong, bare. *Elytra* elongate, slightly widened behind the middle in both sexes, with a very shallow transverse impression at one-fourth from the base; the striæ with deep close punctures, the intervals of equal height, except that the suture is distinctly elevated at the top of the declivity; the scales round, the setæ very short, irregular, appressed and very inconspicuous. *Legs* slender, paler than the antennæ, with sparse grey scaling.

Length 4·5–5·1 mm., breadth 1·5–2·0 mm.

N. E. BURMA: Kambaiti, 2000 m., 1 ♂, vi. 1934, 1 ♀, v. 1934.

Distinguished from previously-described species by its narrower and apically more dilated rostrum, the depressed pronotum, and the very inconspicuous setæ on the elytra.

Genus DOLIOPHRON, nov.

Head with the forehead broader than an eye; eyes large, almost round, flat or only slightly convex. *Rostrum* very broad, but also longer than broad, its sides forming a continuous line with those of the head, only slightly narrowing in front, not or but little dilated at the apex; epistome extending well behind the antennæ, bounded by a sharp carina forming an acute angle; scrobes short, curving inwards; oral aperture very oblique, longer than the lower surface of the rostrum; mentum with four setæ. *Antennæ* slender; scape gently curved, gradually clavate, setose, with all the setæ recumbent; funicle with all the joints much longer than broad, 2 not longer than 1; club narrowly elongate. *Prothorax* transverse, subcylindrical, of equal width at base and apex, the former very shallowly bisinuate or truncate, the postocular lobes small or almost obsolete, the vibrissæ distinct. *Elytra* much broader at the shoulders than the prothorax, widest behind the middle. *Legs* slender, with a sharp femoral tooth, the corbels of the hind tibiæ entirely open.

Genotype: *Cyrtepistomus gracilicornis* Fst. (*Corigetus*).

To this genus also belongs *Corigetus tenuicornis* Fst., and five other undescribed Indian species are also known.

This is a homogeneous group of rather small species, and the comparatively long rostrum, of almost the same width throughout, gives them a characteristic facies. The genus is nearly allied to *Cyrtepistomus* Mshl., from which it differs in its longer rostrum, the acute-angled epistome, and the continuance of the epistomal fringe along the whole margin.

Phrixopogon, gen. nov., differs in having 6–8 setæ on the mentum, the corbels of the hind tibiæ with an internal carina, and the prothorax deeply bisinuate at the base and there wider than at the apex.

Doliophron tenuicornis Fst.—1 ♂, Sadon, 1200 m., N.E. Burma, vi.–vii. 1934.

Genus PHRIXOPOGON, nov.

Head not quite continuous with the rostrum laterally, but forming a very wide angle with it, the forehead much broader than an eye; eyes almost round (except in *molitor* Fst.), large, flat or very slightly convex. *Rostrum* very broad, not or only slightly dilated at the apex, tricarinate dorsally, the carinæ not ascending the forehead; epistome elongate, extending well behind the antennæ, its front margin deeply excised, its hind margin sharply carinate and forming an acute angle; scrobes curving inwards; the oral aperture very oblique, much longer than the lower surface of the rostrum; mentum bearing 6–8 setæ. *Antennæ* with the scape strongly curved, gradually widening from base to apex, with the setæ always recumbent; funicle slender, with joint 2 not longer than 1; club long and slender. *Prothorax* transverse, the apex narrower than the deeply bisinuate base; postocular lobes feeble or obsolete, the vibrissæ distinct. *Elytra* with the shoulders oblique and not very much wider than the base of the prothorax, separately rounded at the base, dehiscent at the apex. *Legs* with a sharp femoral tooth; corbels of hind tibiæ enclosed, the inner carina bare; tarsi with the third joint densely spongy throughout on the lower surface, claws free.

Genotype: *Corigetus filicornis* Fst.

Other species to be referred to this genus are *Corigetus ignarus* Fst. (Hainan), *C. molitor* Fst. (Burma) and *Myllocerinus excisangulus* Reitt. (China).

The only other genus of the group which has 6–8 setæ on the mentum and the corbels of the hind tibiæ with an inner carina is *Deiradorrhinus*, which is described below; it differs in having two high ridges on the forehead, with strongly convex small eyes, and joint 2 of the funicle longer than 1.

Phrixopogon hirtus, sp. n.

♂♀. Derm piceous to black, with dense uniform greyish-white scaling above and below, the head and rostrum often yellowish.

Head with the sculpture hidden by dense scaling and suberect setæ, the forehead flat transversely and separated from the rostrum by a very shallow impression. *Rostrum* about as long as broad, narrowing slightly from the base to the middle then widening gradually to the apex; the dorsal area densely squamose, somewhat depressed anteriorly, with a slight transverse costa adjoining the angle of the epistome, the lateral carinæ continued distinctly to the base and higher than the median carina. *Antennæ* black, densely squamose, the club red-brown; funicle with the two basal joints equal, 3–7 subequal, about twice as long as broad, 3 one-third as long as 2; club of ♂ longer than the apical 4 funicular joints, that of ♀ as long as 3 joints only. *Prothorax* (3 : 4), widest at the base, very slightly rounded at the sides, with feeble postocular lobes, the dorsum with a shallow impression on each side near the base. *Scutellum* subquadrate, shiny, with a few sparse setæ. *Elytra* oblong-ovate, parallel-sided to beyond the middle in ♂, somewhat dilated posteriorly in ♀, the apices separately acuminate and bearing a fringe of long yellow setæ; the rather large punctures in the very shallow striæ almost concealed by scaling or appearing as remote small points the intervals flat, each with a row of numerous, partly irregular, long erect yellow setæ which are longer on the declivity.

Length 7·3–9·2 mm., breadth 3–4 mm.

BURMA: Tenasserim, Sukli, 600 m., 75 km. E. of Moulmein, 3 ♂♂, 2 ♀♀, x. 1934.

Easily distinguished from all its congeners by the very long erect setæ on the elytra.

Phrixopogon mystacinus, sp. n.

♂♀. Derm black, with dense uniform grey to greenish-grey scaling.

Head with the forehead separated from the rostrum by a very shallow impression, flat transversely, finely striolate, the striæ partly visible between the rather thin scaling and short recumbent setæ, the scaling round the eyes paler and much denser. *Rostrum* a little shorter than its apical width, the apex being somewhat wider than the base, with the sides sinuate; the dorsal area only shallowly impressed, with the lateral carinæ low, squamose, and becoming indistinct behind, the median carina much higher, bare, and continued strongly to the base, without any anterior transverse costa; the supra-epistomal setæ yellowish, much longer and denser than usual. *Antennæ* red-brown (including club), the scape with sparse narrow scales, the funicle setose only; funicle very long and slender, the distal joints elongate and abruptly clavate, 1 longer than 2, 3–6 subequal, 7 a little longer, more than three times as long as broad; club narrow, as long as 2¼ preceding funicular joints (in both sexes), joint 3 abruptly narrower than 2. *Prothorax* (3 : 4), very slightly rounded laterally, widest at or a little behind the middle, with feeble postocular lobes; the dorsum with the separated punctures partly visible through the scaling, and a rounded impression on each side near the base. *Scutellum* subquadrate, squamose. *Elytra* much wider at the roundly-rectangular shoulders than the base of the prothorax, parallel-sided to beyond the middle in ♂, slightly dilated behind the middle in ♀, separately rounded at the apex, with the suture strongly and obtusely elevated at the top of the declivity, a shallow depression behind the scutellum with a low obtuse elevation on each side of it between striæ 1 and 4, and an indefinite shallow depression immediately behind this elevation ; the striæ with small punctures showing through the scaling which become much reduced behind ; the intervals smooth, slightly convex, with numerous irregular small appressed scale-like setæ. *Legs* with the corbels of the hind tibiæ partly enclosed, though not in the normal manner, there being no bare internal carina, but the marginal fringe of setæ is inclined strongly inwards towards the tarsus instead of being inclined outwards as usual.

Length 6·8–8·2 mm., breadth 2·6–3·5 mm.

N.E. BURMA : Kambaiti, 2000 m., 2 ♂♂, 6 ♀♀, v.–vi. 1934.

A somewhat atypical species, differing from the others with which it is provisionally associated in the structure of the corbels of the hind tibiæ and in the prominent shoulders to the elytra ; the dense epistomal bristles and the elevated suture are also distinctive.

Genus DEIRADORRHINUS, nov.

Head with a high ridge on each side of the forehead, these being extensions of the dorsal carinæ on the rostrum ; eyes comparatively small, nearly round, strongly convex, highest behind the middle. *Rostrum* not forming a straight line laterally with the sides of the head (the line being sinuate at the junction), narrowing slightly from the base to the middle then widening a little to the apex ; the dorsal area deeply depressed in the middle, without any median carina in the sulcus or any transverse ridge behind the epistome, its sides raised into a high carinate ridge extending on to the forehead ; scrobes short, curved inwards ; epistome deeply excised in front, its hind margin sharply carinate, and forming an acute angle which extends well behind the antennæ ; oral aperture very oblique, much longer than the lower surface of the rostrum ; mentum with 6–8 setæ. *Antennæ* densely squamose ; scape strongly curved ; funicle with joint 2 longer than 1, the distal joints longer than broad and cylindrical ; club very narrow, elongate. *Prothorax* transverse, subconical, deeply bisinuate at the base, without any trace of postocular lobes, but with well-developed vibrissæ. *Elytra* with very oblique shoulders, which are not very much wider than the base of the prothorax, separately rounded at the base, dehiscent at the apex, the intervals with numerous irregular setæ. *Legs* with a sharp femoral tooth; corbels of hind tibiæ partly enclosed, containing a short bare internal carina; third joint of tarsi entirely spongy beneath.

Genotype: *Peltotrachelus isabellinus* Boh. (*Myllocerus*).

To this genus must also be referred *Peltotrachelus illobatus* Mshl., 1917 (omitted from Coleopt. Catal., pars. 114).

Allied to *Peltotrachelus* Mshl., which differs in presenting the following combination of characters:—mentum with only two setæ; corbels of hind tibiæ entirely open, without any internal carina; postocular lobes of prothorax strongly developed; antennæ setose and not squamose, with the scape straight.

From other allied genera *Deiradorrhinus* may be distinguished *inter alia* by the unusually high ridges on the rostrum, which extend on to the forehead.

Deiradorrhinus virescens, sp. n.

♂♀. Derm black with uniform dense greyish-green scaling, the head, rostrum and pronotum sometimes with a pale brown suffusion.

Head with the sculpture hidden by dense scaling, the forehead much higher than the level of the eyes and twice as broad as an eye. *Rostrum* about as long as broad, in the ♂ parallel-sided in the basal half and rather strongly dilated at the apex, in the ♀ not wider at the apex than at the base and with the sides feebly sinuate; the dorsal area densely squamose right up to the epistome. *Antennæ* with the scape not impressed dorsally; funicle with joints 3 and 4 equal. *Prothorax* strongly transverse, nearly twice as broad as long, widest at the base, feebly rounded laterally; the dorsum rather uneven, rugosely punctate, but the scuplture largely hidden by scaling, with a broad shallow oblique depression on each side behind the middle. *Scutellum* transverse, densely squamose. *Elytra* a little wider behind the middle in both sexes, separately rounded at the apex and with a fringe of stiff setæ; the striæ with fairly large close punctures, which appear small and distant when the scaling is intact; the intervals slightly convex, with numerous irregular short recumbent setæ interspersed behind the middle with longer broad suberect setæ. *Legs* black, with fairly dense greenish scaling; front tibiæ subangulate on the inner edge at one-third from the base.

Length 8–9 mm., breadth 3·5–4·0 mm.

Burma: S. Shan States, S. end of Inle Lake, 900 m., 1 ♂, 1 ♀, ix. 1934.

This insect differs from both the other species in the genus by its much more transverse prothorax; moreover, *isabellinus* (Java) has no green scaling and the carinæ on the rostrum are higher and more sinuous; and *illobatus* (Burma) has the elytra more pear-shaped, being narrower at the shoulders and wider behind the middle, with the apex subtruncate.

Genus Deiradolcus, nov.

Head with the forehead flat or shallowly concave transversely, as wide as or wider than an eye; eyes distinctly convex. *Rostrum* with its sides not forming a straight line with those of the head; the median area with a transverse carina at a short distance behind the epistome, the space between them concave and divided by a longitudinal carina; the lateral areas with an oblique carina terminating the scrobe posteriorly then curving backwards towards the eye; epistome with its carinate margin forming an acute angle, which extends only very shortly behind the antennæ; mentum with only two setæ. *Antennæ* with the scape stout, very strongly curved, more or less compressed, not clavate, but either parallel-sided or very gradually widening distally; the proportions of the two basal joints of the funicle variable. *Prothorax* transverse, deeply bisinuate at the base, which is always distinctly broader than the apex, with no postocular lobes, the vibrissæ distinct. *Elytra* strongly rounded separately at the base, dehiscent at the apex. *Legs* with a small sharp femoral tooth, front tibiæ sinuate internally at the base, corbels of hind tibiæ entirely open.

Genotype: *Corigetus moratus* Fst.

To this genus must also be assigned the following species of *Corigetus*:—*lictor* Fst., *discolor* Fst., *neglectus* Fst., *corbetti* Mshl., *hedini* Mshl., and *Myllocerus scapularis* Roel., and four or five undescribed species are also known.

From all the four new genera described above *Deiradolcus* may be distinguished *inter alia* by having only two setæ on the mentum. The other related genera of the group, which also have two setæ on the mentum and no carina in the corbel of the hind tibiæ, are *Amblyrrhinus* Schh. and *Peltotrachelus* Mshl., and these differ in having no oblique carina closing the scrobes posteriorly, the dorsal carinæ of the rostrum ascend the forehead, the eyes are almost flat, and the postocular lobes are strongly developed.

Deiradolcus mutans, sp. n.

♂♀. Derm honey-brown throughout, with dense pale brown scaling above and grey beneath; elytra variable in colour, being sometimes almost uniform pale brown, but usually (typical form) turning gradually paler laterally beyond stria 6, with a macular blackish stripe behind the middle on intervals 6 and 7 and then turning obliquely inwards as far as stria 2 on the declivity, the extent of these dark markings varying considerably; in one male (Rangoon) the elytra bear sharply-defined alternate stripes of pale brown and grey.

Head densely squamose, with the forehead flat or very slightly convex transversely, nearly twice as broad as an eye, with a median fovea and short erect setæ; eyes comparatively small, not longer than the space between the eye and the antenna. *Rostrum* a little shorter than its basal width, almost parallel-sided in the basal half and only moderately dilated at the apex; the dorsal area depressed anteriorly, with a very fine inconspicuous median carina, the lateral carinæ diverging behind, the anterior transverse carina much less prominent than usual (rarely obsolescent) and the space between it and the epistome sparsely squamose. *Antennæ* with the scape widening rather rapidly from base to apex, with narrow scales and numerous subrecumbent stiff setæ; funicle rather stout, with setiform scaling, joint 1 longer than 2, 4–7 subequal and about as long as broad, 3 slightly longer. *Prothorax* gradually narrowing from the base, with the sides straight to beyond the middle then curving slightly inwards to the apex, the apical margin vertically truncate laterally, the median lobe of the base rather broadly rounded; the dorsum flat longitudinally in the middle, without any conspicuous depression, the setigerous punctures visible through the scaling. *Scutellum* transverse, sparsely squamose. *Elytra* not much wider than the prothorax at the rather obliquely rounded shoulders, somewhat dilated behind the middle, the dorsal outline almost flat right up to the base; the shallow striæ with small close punctures clearly visible through the scaling; the intervals much broader than the punctures, with a rather irregular row of short suberect setæ. *Legs* rather stouter than usual; tibiæ bisinuate on the lower edge, the front pair with a distinct angle above the middle and the upper edge curved inward at the apex.

Length 4·2–5·0 mm., breadth 1·9–2·1 mm.

BURMA: Rangoon, 7 ♂♂, 3 ♀♀, xi–xii. 1934 (type).
SIAM: Medaw, Burmese frontier, 1 ♂, xi. 1934.

A distinct species, coming nearest to the genotype, *D. moratus* Fst., which is a black insect with rather sparse narrow greenish-white scales and without erect setæ; the dorsal carinæ are parallel and run in a straight line from apex to base of the rostrum; the scape is compressed and much more strongly bent, the funicle slender and elongate, with joint 2 much longer than 1, etc.

Genus CRINORRHINUS, nov.

Head with the forehead not wider (and sometimes narrower) than an eye and separated from the rostrum by a distinct transverse impression; eyes large, round, and almost flat. *Rostrum* stout, a little longer than its basal width, narrower at its base than the head, strongly dilated at the apex; the lateral carinæ of the dorsal area converging strongly posteriorly, running straight from apex to base; epistome bounded by a sharp carina which is more or less angulated; mentum with four setæ, the outer ones long, the inner ones much shorter; the oral aperture very oblique, as long as the lower surface of the rostrum, the left mandible without a prominent tooth. *Antennæ* elongate; scape slender, moderately curved, gradually clavate, setose, the setæ recumbent; funicle with joint 2 longer than 1; club narrowly elongate. *Prothorax* transverse, bisinuate at the base, which is not wider than the apex; the ocular lobes short and broadly rounded, the vibrissæ short. *Scutellum* small, bare or sparsely setose. *Elytra* more or less dilated behind the middle in both sexes, separately rounded at the base and dehiscent at the apex, much wider at the shoulders than the prothorax ; the clothing consisting of short recumbent setæ and occasionally some patches of narrow scales, the body being often covered with a white powder. *Legs* with the femoral tooth broadly triangular, with its distal edge carinate (except in *strabo*, sp. n., in which the tooth is small and sharp) ; tibiæ deeply sinuate at the base on the inner edge, the corbels of the hind pair entirely open, the claws free.

Genotype : *Phytoscaphus crassirostris* Fst.

To this genus must also be referred *Phytoscaphus foveifrons* Fst. and *Corigetus disjunctus* Fst., and some seven or eight undescribed species are also known.

Most closely related to *Meionops* Mshl., 1917, which differs as follows :—forehead twice as broad as an eye ; joint 2 of funicle shorter than 1 ; elytra at the shoulders not or only slightly wider than the middle of the prothorax ; wings not functional ; left mandible with a sharply-projecting median tooth ; clothing consisting of normal dense round scales.

Phytoscaphus has a much longer narrow rostrum, which is not separated from the forehead by a depression, the oral aperture is almost vertical (instead of oblique) and shorter than the lower surface of the rostrum ; and the mentum bears only two setæ.

Crinorrhinus strabo, sp. n.

♀. Derm black to red-brown ; upper surface clothed with very short sparse recumbent setæ, there being some pale metallic scaling at the sides of the head, prothorax, and elytra, and along the lateral margin of the sternum, the whole surface being normally covered with dense white powder.

Head with a large patch of dense brassy or pale green scales below the eyes and a narrow ring above them, and a row of short erect setæ along their inner margin ; forehead much narrower than an eye (2 : 3), with a deep median fovea. *Rostrum* as long as its basal width, parallel-sided from the base to the middle and dilated at the apex ; the dorsal area much narrowed behind, being nearly twice as wide between the antennæ as at the base, shallowly impressed, with a distinct median carina on the anterior half only; epistome very short, not extending behind the antennæ, its hind margin forming a very wide obtuse angle. *Antennæ* with joint 2 of the funicle nearly twice as long as 1 (8 : 5). *Prothorax* feebly rounded laterally, widest behind the middle, rather deeply bisinuate at the base, closely and somewhat rugosely punctate, with the intervals often subgranulate on the posterior half, the two post-median impressions rather small and shallow. *Elytra* widest behind the middle, the striæ containing small, deep, close punctures; the intervals slightly convex, finely rugulose. *Legs* setose, the posterior pairs of femora with a band of sparse scaling near the apex; the femoral tooth small and sharp, not triangular as in the other species.

Length 5·5–6·2 mm., breadth 2·5–3·2 mm.

BURMA: Rangoon, 2 ♀♀ (*L. T. Atkinson*—type); Palon, 1 ♀ (*Fea*—Genoa Mus.); Tenasserim, Mekane, 90 km. E. of Moulmein, 200 m., 1 ♀, xi. 1934 (*Dr. Malaise*).

Allied to the genotype, *C. crassirostris* Fst., which differs in having the forehead as broad as an eye; the posterior angle of the epistome is a right-angle and extends behind the antennæ; the distal joints of the funicle are much more elongate; the prothorax is more rounded laterally and widest at the middle; the intervals on the elytra are more convex and quite smooth; and the femoral tooth is broadly triangular.

Phytoscaphus carinirostris Fst.—4 ♂♂, 1 ♀, Taunggyi, 1500 m., S. Shan States, viii.–ix. 1934.

Phytoscaphus nubilus Fst.—1 ♂, Sadon, 1200 m., N.E. Burma, vi.–vii. 1934; 1 ♀, 40 km. E. of Taunggyi, ix.–x. 1934.

Calomycterus inæqualis, sp. n.

♀. Derm red-brown, with very sparse minute, narrow, pale scales, and a few erect setæ.

Head with fine oblique striolæ converging towards the deep median stria, the forehead shallowly depressed transversely and much broader than the flattened eye. *Rostrum* about as long as its basal width, with its sides in a straight line with those of the head, gradually narrowing from the base to far beyond the middle and moderately dilated at the apex; the dorsal area shallowly depressed, with a distinct complete median carina, its lateral carinæ parallel; the lateral areas with a broad deep sulcus running straight from the upper edge of the scrobe to the eye; epistome steeply declivous, deeply concave, bounded by a high carina extending behind the antennæ and rounded at its apex, the supra-epistomal setæ sparse and absent behind the antennæ. *Antennæ* very long and slender; scape curved, gradually clavate, with sparse setiform scales and short subrecumbent setæ; funicle with the two basal joints long and equal, the distal joints elongate and clavate; club long and slender. *Prothorax* transverse (7 : 11), rounded laterally in the middle and narrowing equally to base and apex, truncate at the base, the post-ocular lobes distinct; the dorsum flat longitudinally in the middle, coarsely punctate, with a shallow transverse impression before and behind the middle on each side and a low irregular median carina which is raised into an obtuse elevation at the base. *Elytra* subglobose, very convex, narrow at the base and rapidly widening to the middle, strongly rounded laterally, and jointly rounded at the apex; the dorsal outline strongly convex, highest at the middle and sloping almost as steeply in front as behind; the broad striæ containing large close subquadrate punctures; the intervals slightly convex, not or but little broader than the striæ, except where the somewhat irregular low rounded tubercles occur, there being five or six on intervals 3 and 5, two indistinct ones on 6, a low one at the middle of 4, and a row of much smaller ones on the posterior half of 1; each of the tubercles with one or two short stout erect setæ. *Legs* rather long and slender, concolorous with the body, with sparse narrow pale scales; femora with a small sharp tooth; front tibiæ sinuate beneath at the base; tarsi with joint 2 much longer than broad, 3 much broader than 2.

Length 4·5–5·0 mm., breadth 2·4–2·6 mm.

N.E. Burma: Kambaiti, 2000 m., 4 ♀♀, vi. 1934.

This species may be readily distinguished from all its previously-described congeners by its nodose elytra, which are also more narrowed at the base.

Calomycterus nodosus, sp. n.

♂. Derm red-brown, with sparse ovate grey scales, the antennæ and legs paler.

Head with coarse longitudinal striolæ, the forehead flat transversely, nearly twice as broad as the flattened eye, with a median stria. *Rostrum* a little longer than its basal width, rapidly narrowing from the base to beyond the middle and strongly dilated at the apex ; the dorsal area narrow, shallowly depressed, with the median carina partly hidden by scaling, the lateral carinæ diverging slightly behind and with an additional carina adjoining them externally, and below this a shallow longitudinal sulcus from the scrobe to the eye ; epistome almost perpendicular, flat, its hind margin obtusely angulate and not extending behind the antennæ, with only two or three epistomal setæ on each side. *Antennæ* with the scape rather abruptly clavate, with recumbent setæ ; funicle with joint 1 a little longer and thicker than 2, the distal joints not or only slightly longer than broad ; club fusiform, relatively broader than in *inæqualis*. *Prothorax* less transverse (10 : 13), moderately rounded laterally, widest a little beyond the middle, truncate at the base, which is as wide as the apex, the postocular lobes rather short ; the dorsum flat longitudinally in the middle, coarsely and rugosely punctate, with two shallow impressions on each side and a low irregular median carina, without any basal elevation. *Elytra* very similar to those of *inæqualis*, but much narrower in proportion and less convex longitudinally, the greatest height being behind the middle, and the slope towards the base much less steep ; intervals 3 and 5 have only three distinct tubercles each, there is a very low one at the middle of 4, and the others are obsolescent ; the scales are much broader and denser, and the elevations each bear numerous spatulate setæ. *Legs* as in *inæqualis*, except that in the tarsi joint 2 is not longer than broad and 3 is not broader than 2.

Length 2·6 mm., breadth 1·1 mm.

N.E. Burma : Kambaiti, 2000 m., 2 ♂♂, vi. 1934.

Like a diminutive specimen of *C. inæqualis*, but differing notably *inter alia* in the very different structure of the rostrum, antennæ and tarsi.

Subfamily *Sitoninæ.*

Eugnathus pyriformis, sp. n.

♀. Derm black; head and prothorax with mixed light brown and grey scaling; elytra with a broad ill-defined grey humeral stripe between striæ 4 and 7 extending from the base to one-fourth, a narrow transverse grey band across the top of the declivity, the inflexed margins and the posterior declivity with dense fawn or brown scaling, and an elongate pale patch at the base of the suture, the rest of the dorsum with mostly dark brown smaller scales; underside with dense grey and fawn scaling, except on the last three ventrites which are almost bare.

Head with coarse longitudinally confluent punctures and with dense broad scales in the middle, the forehead very shallowly concave and a little wider than the dorsal area of the rostrum; eyes moderately convex. *Rostrum* narrowing slightly from base to apex, with the dorsal area broadly and rather deeply impressed, sharply carinate laterally and with a deep median stria which extends for a short distance on the forehead. *Antennæ* with the two basal joints of the funicle subequal, 7 as long as broad. *Prothorax* as long as broad, only slightly rounded laterally, widest in front of the middle, constricted at the base and near the apex, the latter a little wider than the base, the subapical constriction continued shallowly across the disk; the dorsum only slightly convex longitudinally, much higher at the apex than at the base, with coarse confluent punctation, the shiny subgranulate intervals of which are visible between the broad scales, the granules becoming more definite laterally. *Elytra* 1·5 times as long as broad, comparatively narrow at the shoulders and broadly dilated behind the middle, then rapidly narrowing posteriorly, the apical portion more produced and the posterior declivity less steep than usual, the apices narrowly separated and each with a small tuft of setæ; the dorsal outline strongly convex, rising from the base to far behind the middle, with a very shallow broad transverse impression at one-fifth from the base; the striæ shallow, with large round distant punctures which almost disappear posteriorly; the intervals on the disk scarcely broader than the punctures, smooth, the short irregular recumbent setæ very inconspicuous. *Legs* with dense pale fawn and grey scales ; front tibiæ straight, only slightly wider at the apex.

Length 7·5–8·5 mm., breadth 3·0–3·5 mm.

N.E. BURMA : Kambaiti, 7000 feet, 1 ♀, vi. 1934 (type) ; Sadon, 4000 feet, 1 ♀, vi.–vii. 1934.

This species is distinguished by its comparatively long and narrow thorax, and its broadly dilated elytra with their unusual dorsal convexity.

XXXI.—*New Species of* Staphylinidæ (*Col.*) *from the Philippines*. By MALCOLM CAMERON, M.B., R.N., F R.E.S.

(Continued from ser. 11, vol. vii. 1941, p. 447.)

STAPHYLININÆ.

Hesperus obscuricollis, sp. n. (Bernh. *in litt.*).

Shining, black, the elytra with the base reddish, the posterior margin narrowly and obscurely yellow ; abdomen slightly iridescent. Antennæ black, the last two segments and legs reddish yellow. Length 7·5 mm.

Near *nigriventris* Grid., of the same build and similar antennal structure, but with the base of the elytra more extensively red, the posterior margin much more narrowly and obscurely reddish yellow, the first segment of the antennæ black, in all other respects like *nigriventris*.

♂ : 6th sternite with moderate arcuate emargination at the middle of the posterior border.

Mindanao : Surigao. Type in my collection.

Hesperus segmentarius, sp. n. (Bernh. *in litt.*).

Shining black, the elytra reddish yellow with broad well-defined transverse black fascia across the middle but leaving the suture very narrowly reddish yellow ; abdomen strongly iridescent, the posterior margins of the 3rd to 5th visible tergites obscurely reddish yellow. Antennæ black, the 1st segment and base of 2nd reddish yellow, the last three orange-yellow. Legs reddish yellow. Length 7·5 mm.

Differs from *obscuricollis* Cam. in the colour-pattern of the elytra, the strongly iridescent abdomen, the colour of the antennæ, the penultimate segments of which are a little longer ; in all other respects similar.

Hesperus ruficeps, sp. n. (Bernh. *in litt.*).

Shining, head and thorax red, the former with the post-ocular region infuscate ; elytra reddish yellow, with oblique oval blackish spot extending from the reflexed side near the postero-external angle towards the middle of the suture but not reaching it (as in *Roepkei* Bernh.) ; abdomen blackish, strongly iridescent, the posterior margin of the tergites broadly rufescent. Antennæ with the first three segments red, the last four orange-yellow, the intermediate blackish. Legs reddish yellow. Length 7 mm.

Build of *lævigatus* Fauv., and only differing in the coloration.

Tangcolan : Bukidnon (*Baker*). Type in my collection.

Hesperus punctipennis, sp. n.

Shining, head and thorax red, the post-ocular region of the former and posterior margin of the latter infuscate ; scutellum red ; elytra reddish yellow with transverse black fascia across the middle, not quite reaching the suture ; abdomen strongly iridescent, the first four visible tergites reddish, the following black with the posterior margin reddish yellow. Antennæ reddish yellow, the 4th to 6th segments infuscate. Legs reddish yellow. Length 7·5 mm.

Very similar in general coloration and build to *ruficeps* Cam. and with similarly constructed antennæ, but the head is less transverse, more orbicular and as broad as the thorax, the scutellum more closely punctured, the black fascia of the elytra broader and nearly reaching the suture, but at once recognised by the much closer puncturation of the elytra which distinguishes it from all the species of the *lævigatus* group.

♂ : unknown.

Tangcolan : Bukidnon (*Baker*). Unique. My collection.

Belonuchus ferrugatus Er. var. *rufotestaceus*, n. (Bernh. *in litt.*).

Only differs from var. *ruficeps* Cam. in the colour of the last tergite, which in *ruficeps* is clear reddish yellow whilst in this form it is pitchy black, only the posterior margin being narrowly reddish yellow. The single specimen, a ♀, is 8 mm. in length.

Luzon : Los Banos. My collection.

Staphylinus (*Platydracus*) *philippinus*, sp. n. (Bernh. *in litt.*).

Very near *asemus* Kr., but at once recognised by the reddish-yellow legs, only the tarsi dark, also the black head and thorax is much less metallic, less pubescent, the sculpture, however, scarcely differing, the elytra are more evidently mottled with silvery and golden pubescence, the pubescence of the abdomen scarcely differs from that of *asemus* and in other respects similar. Length 13 mm.

Mindanao : Pt. Rango. Type in my collection.

Staphylinus (*Platydracus*) *nigripennis*, sp. n. (Bernh. *in litt.*).

Entirely black, rather dull. Antennæ black. Legs reddish yellow, the tarsi darker. Length 11 mm.

In build and lustre much resembling *sepulchralis* Er., but with shorter antennæ, the penultimate segments more transverse ; head with small median shining plaque, elsewhere more coarsely punctured than in that species ; thorax with narrow shining median line, a little less coarsely punctured than the head but much more coarsely than in *sepulchralis* ; scutellum black, tomentose ; elytra with sculpture scarcely differing from that of *sepulchralis* ; abdomen more coarsely and less closely punctured, the pubescence much more scanty but longer and coarser than in that species, that of the fore parts as in *sepulchralis*.

Luzon : Imugan. Type in my collection.

Staphylinus (*Platydracus*) *insularis*, sp. n. (Bernh. *in litt.*).

Head and thorax moderately shining, coppery bronze; scutellum black, tomentose; elytra dull, dark brown, the reflexed sides and posterior margin lighter; abdomen black, the posterior margin of the 7th and 8th tergites narrowly reddish yellow. Antennæ black. Legs reddish yellow, the femora more or less infuscate along the anterior border. Length 11·5 mm.

Build of *philippinus* Cam., but with the head and thorax much more strongly metallic, the puncturation not quite so coarse, the dark brown elytra have similar dense coriaceous sculpture but are not mottled, the pubescence uniform and long; the abdomen is not bifariate and is without median basal spots of lighter pubescence, which is rather long, coarse and uniform.

♂: unknown.

Luzon: Laguna. A single specimen in my collection.

Staphylinus (*Platydracus*) *aurichalceus*, sp. n. (Bernh. *in litt.*).

Head and thorax moderately shining, greenish bronze; scutellum black, tomentose; elytra dull, light chestnut-red, indistinctly mottled; abdomen blackish, the raised lateral and posterior margins of the tergites rather broadly yellowish red. Antennæ black, the first three segments and legs bright reddish yellow. Length 9·5 mm.

Near *chalceus* Bernh., the fore parts similarly coloured, but smaller, the puncturation of the head and thorax not quite so coarse, abdomen not bifariate, the pubescence uniform, long and yellow, that of the fore parts as in *chalceus* and in other respects similar.

Samar: Catbalogan. Type in my collection.

Quedius (*Raphirus*) *philippinus*, sp. n. (Bernh. *in litt.*).

Very like *borneensis* Cam., but at once distinguished by the anterior and middle femora being reddish yellow and also in the following respects: the thorax is narrower, the sides practically straight and slightly retracted towards the front, besides the usual punctures with a few extremely small scattered ones, the abdomen more sparingly punctured and less pubescent. The 11th segment of the antennæ is yellow, the 10th brownish yellow, the structure scarcely differing in the two species. Ground-sculpture absent throughout. Labrum bilobed and in other respects similar. Length 10 mm.

Var. *apicalis*, n. Last tergite yellow; femora pitch black.

Luzon: Balbalan. Type in my collection.

Acylophorus ruficeps, sp. n. (Bernh. *in litt.*).

Shining, head and thorax red, elytra and abdomen dark reddish brown, the latter strongly iridescent. Antennæ blackish, the bases of the first two segments and the 10th and 11th reddish yellow. Legs reddish yellow. Length 5·5 mm.

Very distinct by the colour. Head narrow as in *scutellaris* Bernh. Antennæ with the penultimate segments as long as broad. Thorax transverse (4·5 : 3·75), convex, the sides yet more strongly rounded than in *scutellaris*. Elytra a little longer than the thorax, moderately, finely, closely and roughly punctured. Abdomen much less closely punctured than in *scutellaris*.

Mindanao: Surigao. Type in my collection.

TACHYPORINÆ.

Bolitobius philippinus, sp. n. (Bernh. *in litt.*).

Build of *nitidus* Motsch. and (except for the yellowish-red head) of similar coloration, differs in the shorter, stouter and differently coloured antennæ, the first three segments reddish yellow, the following dark reddish, the 11th only obscurely lighter, the 2nd to 4th evidently shorter than in *nitidus*, the following as in that species, about as long as broad. Length 3·75 mm.

Mindanao: Surigao. Type in my collection.

Conosoma aureiventris, sp. n. (Bernh. *in litt.*).

Rather shining, black, the last two tergites posteriorly obscurely lighter. Antennæ reddish yellow, the 5th to 10th segments blackish. Legs reddish yellow. Length 4 mm. (abdomen extended).

In build very like *immaculatum* Steph., but blacker, the thorax shorter, the antennæ very similarly constructed except that the 4th and 5th segments are shorter; thorax shorter, less closely punctured; elytra scarcely differing in sculpture; abdomen less finely punctured, all the segments with long black lateral setæ. Thorax transverse (3·75 : 3); elytra as long as the thorax, a little narrowed behind, transverse (3·75 : 3). The whole insect with a fine, rather close, golden pubescence.

Luzon: Mt. Banahao. Type in my collection.

Conosoma subdepressum, sp. n. (Bernh. *in litt.*).

Black, rather dull. Antennæ black, the first two segments reddish yellow. Anterior and middle legs yellowish red, the posterior blackish. Length 4·5 mm.

Sub-depressed, sooty black, in build and antennal structure much resembling *virgula* Fauv.; the whole insect very densely and finely punctured and pubescent. Antennæ long and slender, extending beyond the base of the elytra, the penultimate segments (seen on the flat) as long as broad, the 11th a little longer than the 10th. Thorax transverse (5 : 4), the posterior angles somewhat produced backwards. Elytra longer than the thorax (5·5 : 4), a little narrowed behind. Abdomen pointed, without setæ on the first three visible tergites.

Luzon: Mt. Polis. Type in my collection.

Var. *fuscipes*, n. An example from Gunung Singgalang, Sumatra, has darker, extensively infuscate legs. In my collection.

Conosoma elegantulum, sp. n. (Bernh. *in litt.*).

Moderately shining, black, the elytra yellow with the scutellary region and the suture triangularly black, the reflexed sides also blackish. Antennæ black, the first two segments and legs reddish yellow. Length 3·5 mm.

Build of *gracile* Kr., and with similar long slender antennæ, but with differently coloured elytra. The whole insect extremely finely and densely punctured and pubescent. Antennæ extending a little beyond the middle of the elytra, all the segments much longer than broad, the 11th distinctly longer than the 10th. Thorax transverse (3·75 : 3). Elytra longer than the thorax

(3·5 : 3), a little narrowed behind. Abdomen pointed, without setæ on the first three visible tergites.

Luzon: Balbalan. Mindoro: Subaon. Type in my collection.

Conosoma montalbense, sp. n. (Bernh. *in litt.*).

Moderately shining, red, the head more or less infuscate behind; the thorax broadly infuscate along the middle; the elytra with an obscure oval blackish spot behind, extending obliquely from the side margin towards the suture; abdomen blackish, the posterior margin of the tergites narrowly rufescent. Antennæ and legs reddish yellow. Length 2 mm. (abdomen extended).

Head practically impunctate and without ground-sculpture. Antennæ long and slender, extending a little beyond the posterior angles of the thorax, all the segments distinctly longer than broad. Thorax transverse (3 : 2·3), extremely finely, rather closely punctured, the ground-sculpture very fine. Elytra longer (3 : 2) than the thorax, a little narrowed behind, extremely finely but more closely punctured. Abdomen strongly narrowed towards apex, except for the last tergite extremely finely and rather closely punctured, the sides and apex with long black setæ. The whole insect with a fine yellow pubescence.

Montalla. Type in my collection.

Conosoma setosum, sp. n. (Bernh. *in litt.*).

Shining, fore parts reddish yellow, abdomen with the first three visible tergites reddish, the following yellow. Antennæ reddish yellow, the 7th to 9th segments black. Legs reddish yellow. Length 2–2·5 mm.

Build of *bipunctatum* Gr., the antennæ similarly constructed, the sculpture scarcely different, but differently coloured, and the five lateral setæ of the elytra longer and stronger. Otherwise similar.

Manila. Type in my collection.

Tachinomorphus fulvipes Er. var. *philippinus*, n. (*apicicornis* Bernh. *in litt.*).

Differs from the type-form in the last three antennal segments being reddish yellow, the black marking of the elytra more defined and triangular in shape, reaching the apex of the suture; the head and thorax are in some examples dark reddish brown.

Luzon: Los Banos.

Var. *rufus*, n. (Bernh. *in litt.*).

Differs from the type-form in the entirely red colour, only the elytra infuscate posteriorly. Antennæ and legs red.

Mindanao: Surigao. Type in my collection.

Coproporus latiusculus, sp. n. (Bernh. *in litt.*).

Very closely allied to *flavicornis* Kr., and only differing in the following respects: the 4th to 9th antennal segments are slightly infuscate, the thorax has two small basal punctures before the scutellum as in *brunneicollis* Motsch., but is quite without the extremely fine scattered punctures seen in *flavicornis*, the ground-sculpture is, however, similar in the two species, the puncturation of the elytra is not so fine, more like that of *brunneicollis*, the puncturation of the abdomen is fine, as in *flavicornis*. Length 2·75 mm. (abdomen retracted).

Luzon: Balbalan. Type in my collection.

Coproporus splendidus, sp. n. (Bernh. *in litt.*).

Shining, black, the side margins of the thorax and elytra, the suture and posterior margin of the latter very narrowly and obscurely reddish; abdomen yellowish brown. Antennæ with the first four segments reddish yellow, the following reddish brown. Legs reddish yellow. Length 2 mm. (abdomen retracted).

Size and build of *sanguinolentus* Motsch., but differs in the less extensive and more obscure red coloration of the thorax and elytra; the 3rd segment of the antennæ is shorter, the 4th and 5th longer, longer than in that species, the following slightly transverse; the pair of punctures seen in *sanguinolentus* just behind the anterior margin and also those before the scutellum are absent in this species, but here and there are traces of a transverse, interrupted, wavy ground-sculpture not present in *sanguinolentus*, and a few minute punctures are also visible; the elytra are scarcely perceptibly punctured, whereas in *sanguinolentus* the puncturation is distinct; the abdomen is very finely and very sparingly punctured.

Mindanao: Pt. Bango. Type in my collection.

ALEOCHARINÆ.

Leucocraspedum luzonicum, sp. n. (Bernh. *in litt.*).

Head and thorax rather shining, the former black, the latter yellowish red; elytra and abdomen duller, smoky brown, the posterior margin of the 5th and whole of the 6th tergites reddish yellow. Antennæ and legs reddish yellow. Length 2 mm.

Build of *dilutum* Bernh., but with the thorax redder, the elytra darker, the abdomen not so dark; the antennæ similarly constructed, except that the 11th segment is longer, as long as the three preceding together. Thorax twice as broad as long, extremely finely, moderately closely punctured and without ground-sculpture. Elytra slightly longer than the thorax, less finely, more closely punctured than in *dilutum*, the puncturation rough. Abdomen closely and finely punctured, the pubescence distinctly longer and coarser than in *dilutum*; pubescence of the fore parts fine and rather close.

N. Luzon: Heightsplan. Type in my collection.

Leucocraspedum conicollis, sp. n. (Bernh. *in litt.*).

Head and thorax rather shining, yellowish red, elytra brownish yellow; abdomen with the first two visible tergites reddish, the following pitchy, with the posterior margins reddish yellow, the 5th and 6th more broadly. Antennæ and legs reddish yellow. Length 2·3 mm.

Apart from the colour, differs from *luzonicum* Cam. in the narrower build, the thorax narrower (2·5 : 1·5), antennæ with the 11th segment not so long, only a little longer than the 9th and 10th together. Thorax more closely punctured and pubescent. Elytra a little longer than the thorax, more finely and less roughly punctured than in *luzonicum*, the abdominal pubescence finer.

N. Luzon: Trinidad. Type in my collection.

Leucocraspedum philippinum, sp. n.

Moderately shining, entirely reddish yellow, the elytra very obscurely infuscate behind. Antennæ and legs reddish yellow. Length 1·3 mm.

A very small narrow species, of the colour of *pallidum* Cam., but much smaller, the antennæ shorter, reaching the posterior angles of the thorax, the 3rd segment much shorter than the 2nd, 4th scarcely, 5th to 10th gradually more transverse, the penultimate about twice as broad as long, the 11th stout, about as long as the 8th to 10th together. Thorax transverse (2 : 1·4), very finely, rather closely punctured; ground-sculpture absent. Elytra as long as the thorax, more closely, less finely, roughly punctured. Abdomen pointed, very finely, rather closely punctured. The whole insect with fine, moderately close yellow pubsecence.

This species would appear to be very near *minutum* Bernh., but at once distinguished from it by the differently coloured abdomen.

Leyte. Luzon : Los Banos. Type in my collection.

Leucocraspedum minor, sp. n. (Bernh. *in litt.*).

Head and thorax shining reddish yellow, elytra and abdomen less shining and slightly dark. Antennæ and legs reddish yellow. Length 2·5 mm.

Size and build of *scorpio* Blackb., the antennæ similarly constructed, colour of *philippinum* Cam., puncturation of the thorax yet finer and much more sparing than in *scorpio*, that of the elytra also a little finer but similar in character, the sculpture of the abdomen and setæ scarcely differing from that of *scorpio*. Pubescence fine, yellow, moderately close.

S.E. Luzon : Mt. Bulusan. Type in my collection.

Myllæna philippina, sp. n. (Bernh. *in litt.*).

Blackish brown, a little shining, the last two tergites obscurely yellowish. Antennæ black, the 8th to 11th segments yellow. Legs reddish yellow. Length 1·5 mm.

In build and colour much resembling *dubia* Gr., but smaller, the antennæ much as in *intermedia* Er., but differently coloured. Head extremely finely and closely punctured. Antennæ slender, extending to the base of the elytra, shorter than in *intermedia* but similarly constructed. Thorax transverse (2·75 : 2), the posterior angles produced backwards, extremely finely and densely punctured as in *dubia*. Elytra as long as the thorax, transverse, densely and finely punctured as in that species. Abdomen strongly pointed, as finely but not quite so closely punctured as in *dubia*, the setæ similar. The whole insect very finely and closely pubescent.

Luzon : Pagsanjan. Type in my collection.

Brachida philippina, sp. n. (Bernh. *in litt.*).

Shining, yellowish red. Antennæ yellowish red, the first four segments and legs yellow. Length 1·75 mm.

Readily recognised by the long thick abdominal pubescence, especially noticeable at the sides and apex. A small robust species of the build of *exigua* Heer, but smaller and of the colour of *clara* Wse. Head practically impunctate. Antennæ short, the 4th segment small, the 5th much larger, about as long as broad, 6th to 10th slightly transverse, differing but little, 11th as long as the 9th and 10th together. Thorax nearly twice as broad as long, convex, practically impunctate. Elytra a little longer and broader than the thorax, transverse, finely, moderately closely but not roughly punctured. Abdomen narrowed towards apex, very finely, rather closely punctured, less closely on the 5th visible tergite, the pubescence long and close, especially at the sides and apex. Fore parts with rather long but much more scanty pubescence. Ground-sculpture absent throughout. The single example is probably ♀.

Philippines, without further indication. My collection.

Gyrophæna (*Acanthophæna*) *orientalis*, sp. n.

Shining, dark reddish brown to pitchy black, the abdomen lighter, with the 4th and 5th visible tergites infuscate. Antennæ and legs yellow. Length 2–2·5 mm.

Head with a few small scattered punctures. Antennæ long, the 4th segment longer than broad, the 5th stouter, slightly longer than broad, 6th to 10th about as long as broad and differing but little, 11th as long as the 9th and 10th together. Thorax transverse (2·5 : 1·5), with dorsal row of three punctures and one or two others externally. Elytra a little longer and broader than the thorax, in the ♂ with a few small scattered asperate punctures, in the ♀ with a few small simple punctures chiefly in the scutellary region. Abdomen with a row of fine punctures near the posterior margins of the tergites, otherwise very finely and very sparingly punctured and finely coriaceous. Fore parts without ground-sculpture.

♂. 3rd sternite with broad black pointed lamella on each side adjacent to the 3rd and 4th visible tergites, much like that of *appendiculata* Motsch. in shape; 5th with a transverse row of six small tubercles near the posterior margin; 6th with a pair of stout cultriform processes.

Dinagat. Siargao; Dapa. Type in my collection.

Gyrophæna (s. str.) *maquilingana*, sp. n. (Bernh. *in litt.*).

Shining, pitchy black, the base of the elytra obscurely reddish, the posterior margin of the 5th visible tergite and whole of the 6th dirty yellow. Antennæ blackish, the first four segments and legs yellow. Length 2 mm.

Head broad, nearly as broad as the thorax (3 : 4), with a few small scattered punctures and very fine wavy ground-sculpture. Antennæ short, the 3rd segment shorter than the 2nd, 4th small, transverse, 5th to 10th broader, differing but little amongst themselves, about a half broader than long. Thorax transverse (4 : 2·5), the sides evenly rounded with the base, with dorsal row of four fine punctures and a group of two or three others externally, the ground-sculpture as on the head. Elytra broader and a little longer than the thorax (3 : 2·5), with a few extremely fine scattered punctures, the ground-sculpture similar. Abdomen, except for a row of extremely fine punctures at the posterior margins of the tergites, practically impunctate; the ground-sculpture feeble.

♂. 7th tergite near the posterior margin with transverse row of four little tubercles, the centre pair the largest; 8th with a pair of short stout teeth, the margin between scarcely perceptibly crenulate.

Luzon: Mt. Makiling (*Baker*). Type in my collection. Siargao: Dapa.

Gyrophæna (s. str.) *ruficollis*, sp. n. (Bernh. *in litt.*).

Shining, head and elytra black, the latter with distinct purplish metallic reflex; thorax and abdomen reddish yellow. Antennæ with the first four segments yellow, the following reddish. Legs yellow. Length 1·75–2 mm.

In build much resembling *fasciata* Marsh., but in all other respects different. Head a little narrower than the thorax, between the eyes with a pair of punctures, otherwise almost impunctate and with scarcely visible ground-sculpture. Antennæ rather long, the 3rd segment shorter than the 2nd, 4th small, transverse, 5th to 10th all longer than broad, decreasing in length, the penultimate only slightly longer than broad. Thorax transverse (4·3 : 3), with dorsal row of three fine punctures and one or two others externally, otherwise impunctate and without ground-sculpture. Elytra a little longer than the thorax, with a few very fine scattered punctures and without ground-sculpture. Abdomen extremely finely and very sparingly punctured and with scarcely visible ground-sculpture.

♂ : unknown.

Mindanao : Siargao. Type in my collection.

Gyrophæna (s. str.) *basiventris*, sp. n. (Bernh. *in litt.*).

Shining, fore parts dark ferruginous red, the elytra extensively infuscate posteriorly; abdomen reddish yellow, the 4th visible tergite black. Antennæ red, the first four segments and legs reddish yellow. Length 1·5 mm.

Head with a few minute punctures and fine ground-sculpture. Antennæ rather short, 3rd segment shorter than 2nd, 4th and following transverse, the penultimate about twice as broad as long. Thorax transverse (2·5 : 1·5), the sides evenly rounded with the base, with dorsal row of three fine punctures and one or two others externally, the ground-sculpture feeble, as on the head. Elytra longer than the thorax (2 : 1·5), with very few minute punctures and very fine wavy transverse ground-sculpture. Abdomen, except for marginal rows of extremely fine punctures, almost impunctate, very finely coriaceous.

♂: 7th tergite with a pair of rather large tubercles near the middle of the posterior margin; 8th with several small granules, the posterior margin with five fine short teeth.

Luzon: Los Banos. Type in my collection.

Gyrophæna (s. str.) *punctilinea*, sp. n. (Bernh. *in litt.*).

Shining, black, the elytra pitchy black. Antennæ with the first four segments yellow, the following infuscate. Legs yellow. Length 1·5 mm.

Very near *selangorensis* Cam., but with the head a little narrower, eyes a little smaller, the puncturation and ground-sculpture similar; antennæ shorter and stouter, the penultimate segments more transverse. Thorax with an irregular row of about seven punctures on each side of the middle, externally with a group of three others, in *selangorensis* the punctures on the disc are more numerous, the ground-sculpture in both similar. Elytra yet more sparingly punctured than in *selangorensis*, the ground-sculpture much less evident. Abdomen very finely and very sparingly punctured, the ground sculpture very fine, the 5th visible tergite with a transverse row of six small granules near the posterior border.

♂: 7th tergite with a pair of rather large tubercles in the middle near the posterior margin; 8th with a short stout blunt tooth on each side, the narrow margin between feebly rounded.

Mindanao: Surigao. Momungan. Type in my collection.

Gyrophæna (s. str.) *tenuicornis*, sp. n. (Bernh. *in litt.*).

Shining, head and thorax light ferruginous red, elytra and abdomen reddish yellow, the former infuscate posteriorly. Antennæ with the first three segments yellow, the following blackish. Legs yellow. Length 1·75 mm.

In the build of the thorax much like *manca* Er. Head broad, nearly as broad as the thorax, and with a few small scattered punctures. Antennæ slender, the 3rd segment much shorter than 2nd, 4th small, transverse, 5th and following stouter, all longer than broad, decreasing in length, the penultimate distinctly longer than broad, the 11th a little shorter than the 9th and 10th together. Thorax transverse (3·75 : 2·5), the sides feebly rounded in front, straighter and distinctly retracted behind, the disc with a few small scattered punctures and two or three others externally. Elytra a little longer than the thorax, finely, moderately closely punctured. Abdomen extremely finely, very sparingly punctured, the ground-sculpture feeble. Fore parts without ground-sculpture.

♂ : unknown.

Mindanao : Surigao. Type in my collection.

Plagiusa bang-haasi, sp. n. (Bernh. *in litt.*).

Very near *philippina* Bernh., similar in colour and lustre (except that the posterior femora are infuscate) and antennal structure, but differs at once in the sculpture of the head and thorax, the elytra with similar but rather coarser sculpture than in *philippina* ; the thorax is also shorter and more transverse (3·5 : 2·5) than in that species. Head closely covered with small umbilicate punctures, but not rugose. Thorax with the disc closely covered with rather smaller and distinctly more superficial punctures than on the head, the sides practically impunctate, before the scutellum, with the usual transverse fovea. Abdomen except at the bases of the segments practically impunctate. Length 2 mm.

Mindanao : Momungan. Type in my collection.

Plagiusa opacella, sp. n. (Bernh. *in litt.*).

Dark ferruginous red, the head and thorax rather dull, the elytra and abdomen more shining, the former more or less infuscate posteriorly, the latter with the 3rd and 4th visible tergites black. Antennæ black, the first three segments and the last reddish yellow. Legs reddish yellow. Length 2 mm.

More robust than *ceylonica* Kr. and of darker colour, less shining, thorax more constricted behind. Head narrower than the thorax, closely, rugosely punctured. Antennæ stout, the 3rd segment longer than the 2nd, 4th scarcely longer than broad, 5th to 10th gradually more transverse, the 11th as long as the 9th and 10th together. Thorax transverse (2 : 1·2), convex, the sides strongly rounded in front, strongly sinuately retracted behind, before the scutellum with a transverse fossa, the sculpture much as on the head. Elytra broader and slightly longer than the thorax, closely and more coarsely punctured but not rugose. Abdomen closely and moderately coarsely punctured at the bases of the tergites, more finely and very sparingly elsewhere. Pubescence throughout fine.

♂ : 4th tergite with a strong pointed tubercle in the middle; 7th with a transverse row of four elongate tubercles; 8th produced in the middle as a small triangular plate, concave above and clothed with rather long white pubescence.

Mindanao : Momungan. Luzon : Los Banos. Type in my collection.

Plagiusa luzonica, sp. n. (Bernh. *in litt.*).

Very closely allied to *moultoni* Cam., of the same size, colour, build and antennal structure, but differing in the following respects : the head and thorax are much less shining, the sculpture closer and distinctly rugose, the elytra more broadly infuscate posteriorly, leaving the posterior margin distinctly yellow, the sculpture coarser and distinctly rugose. The ♂ characters, so far as the 4th and 7th tergites are concerned, are similar, but that of the 8th is not visible owing to retraction. Length 2 mm.

Luzon : Los Banos. Type in my collection.

Cœnonica tubericauda, sp. n. (Bernh. *in litt. Silusa*).

Moderately shining black, the posterior margin of the visible tergites narrowly reddish. Antennæ black, the first four segments reddish. Legs reddish yellow. Length 2·3 mm.

Head a little narrower than the thorax (3·5 : 4), except in front closely covered with small superficial umbilicate punctures; finely coriaceous. Antennæ short and stout, the 3rd segment a little longer than the 2nd, 4th as long as broad, 5th to 10th gradually more transverse, the penultimate two-and-a-half times broader than long, the 11th as long as the 8th to 10th together. Thorax transverse (4 : 3), the sides rounded in front, straight and retracted behind, the posterior angles obtuse, before the base in the middle with a U-shaped impression, finely punctured along the middle, very sparingly in front, more closely behind, at the sides with moderately coarse, close, somewhat rugose puncturation; ground-sculpture absent. Elytra longer (4 : 3) and broader than the thorax, closely covered with small granules. Abdomen more shining than the fore parts, very finely and very sparingly punctured and without ground-sculpture.

♂: 7th tergite with three strong longitudinal keels close together near the posterior margin; the structure of the 8th not visible.

Palawan : Binaluan. A single specimen.

Cœnonica canaliculata, sp. n. (Bernh. *in litt. Silusa*).

Moderately shining, head dark red; thorax lighter red with the disc broadly infuscate; elytra with broad indeterminate fascia across the middle, the base red, the posterior margin more narrowly reddish yellow; abdomen pitchy black, the posterior margin of the 5th visible tergite yellowish. Antennæ reddish brown, the 11th segment lighter, the first three segments and legs reddish yellow. Length 2 mm.

A somewhat abnormal species in that the thorax is without the V- or U-shaped impression, and referred to *Silusa* by Bernhauer, but it differs from that genus in the short broad mesosternum as in *Cœnonica*, nor do the labial palpi appear styliform. Head broad but narrower than the thorax, closely covered with small umbilicate punctures. Antennæ thickened towards apex, the 3rd segment slightly longer than the 2nd, 4th and 5th very slightly longer than broad, 6th and 7th as long as broad, 8th to 10th slightly transverse, the 11th as long as the 9th and 10th together. Thorax transverse (3·5 : 2), convex, the sides evenly rounded, the posterior angles obtuse, along the middle with a well-marked sulcus, the punctures similar to but rather smaller than on the head. Elytra longer (3 : 2) and broader than the thorax, transverse, closely punctured, the punctures smaller than on the thorax. Abdomen rather finely, closely punctured, more coarsely in the impressions. The whole insect with a rather short, close greyish pubescence.

Dinagat. A single specimen. In my collection.

Cœnonica obscura, sp. n. (Bernh. *in litt.*).

Rather shining, the abdomen more so. Head black, thorax brown, elytra and abdomen brownish yellow, the 3rd and 4th visible tergites infuscate. Antennæ black, the first three segments and legs reddish yellow. Length 2 mm.

Near *philippina* Bernh., but smaller, in colour somewhat similar, the head narrower in comparison with the thorax, but scarcely differing in sculpture. Antennæ similar except that the 11th segment is shorter, only as long as the three preceding together. Thorax with the disc simply punctured, the punctures close, moderate in size and rather superficial, towards the sides with fine moderately close granular sculpture. Elytra with smaller and less close granules thon in *philippina*, the abdomen scarcely differing in sculpture from that species.

♂ : unknown.

Palawan : Binaluan. Type in my collection.

Placusa (s. str.) *philippina*, sp. n. (Bernh. *in litt.*).

Moderately shining ; head black ; thorax dark reddish brown, elytra pitchy black with the base narrowly and obscurely reddish ; abdomen reddish yellow. Antennæ black, the 1st segment reddish yellow, the 2nd yellowish brown. Legs reddish yellow. Length 2 mm.

Size and build of *acuminata* Kr., but differs in the colour and longer antennæ, the penultimate segments of which are fully as long as broad : the sculpture of the head scarcely differs from that of *acuminata*, but the eyes are smaller. Antennæ rather long and slender, the 3rd segment as long as the 2nd, 4th to 8th a little longer than broad, decreasing in length, 9th and 10th as long as broad, the 11th as long as the 9th and 10th together. Thorax formed as in *acuminata*, with similar but less close sculpture. Elytra less finely, more roughly punctured than in that species. Abdomen less closely and much less finely punctured than in *acuminata*. Pubescence fine and moderately close throughout.

♂ : 8th tergite on each side with a long slender incurved spine, the margin between rounded and with five small crenulations, of which the central is the largest and most prominent ; 6th sternite produced, narrowed and briefly rounded at apex.

Luzon : Balbalan. A single ♀ example. Also, in the Malay Peninsula, Selangor, a ♂ specimen. Type in my collection.

Placusa (s. str.) *minuta*, sp. n. (Bernh. *in litt.*).

Rather shining, head and thorax black, elytra brownish yellow, abdomen light reddish brown. Antennæ black, the first three segments and legs reddish yellow. Length 1 mm.

Build and lustre of *pygmæa* Kr., and except for the elytra of similar colour, but smaller, the antennæ shorter and stouter, the head less finely, more roughly punctured, the puncturation of the thorax scarcely differing from that of *pygmæa*, but that of the elytra obviously coarser and rougher, the puncturation and pubescence of the abdomen distinctly less fine and not so close.

♂ : unknown.

Siargao : Dapa. A single specimen. Type in my collection.

Placusa (s. str.) *minutissima*, sp. n.

Moderately shining ; fore parts black, abdomen pitchy brown. Antennæ black, the first three segments and legs reddish yellow. Length 1 mm.

Narrower than *minuta* Cam., and with dark, more closely and roughly punctured elytra ; the sculpture of the head scarcely differing, the antennæ are thinner but similarly constructed ; the thorax and elytra less finely and more roughly punctured, the abdomen scarcely differing in sculpture and pubescence from *minuta*.

♂ : unknown.

Mindanao : Pt. Bango. A single example.

Stenomastax rufobrunnea, sp. n.
(*Homalota longipennis* Bernh. *in litt. præoc.*).

Moderately shining, head black, the rest light reddish brown, the 4th visible tergite infuscate. Antennæ reddish brown, the first two segments and legs reddish yellow. Length 2 mm.

Near *longipennis* Cam., but smaller and more brightly coloured, the antennæ shorter, the 11th segment shorter. Head nearly as broad as the thorax, coriaceous, with small, close, superficial umbilicate punctures, except in front which is practically impunctate. Antennæ with the 3rd segment shorter than the 2nd, 4th to 10th transverse, increasing in width, the penultimate more than twice as broad as long. Thorax slightly transverse (2·75 : 2·5), the sides rounded in front, straight and retracted behind, the posterior angles obtuse, broadly, superficially impressed along the middle nearly to the anterior border, coriaceous and impunctate. Elytra longer (3·3 : 2·5) and broader than the thorax, coriaceous, the puncturation extremely fine and scarcely distinguishable from the ground-sculpture. Abdomen parallel, coriaceous, extremely finely and very sparingly punctured.

♂ : 8th tergite with a stout blunt tooth on each side, the margin between truncate, on each side of the middle with a pair of closely approximated short blunt processes.

N. Luzon : Heightsplan. Type in my collection.

Stenomastax densissima, sp. n.
(Bernh. *in litt. Homalota*).

Fore parts dull, abdomen shining. Head black, thorax dark reddish brown, elytra pitchy black, abdomen reddish yellow, the 4th visible tergite infuscate. Antennæ black, the first two segments reddish. Legs reddish yellow. Length 2 mm.

Size and build of *platygaster* Kr., the antennæ similarly constructed but of different colour and sculpture. Head strongly coriaceous, almost granular and without distinct puncturation. Thorax broadly superficially impressed along the middle, the ground-sculpture less coarse than on the head and scarcely visibly punctured. Elytra slightly longer than the thorax, closely covered with small granules. Abdomen parallel, the first two visible tergites finely and closely punctured at their bases and posteriorly with very small close granules, the following almost impunctate and without ground-sculpture.

♂ : 8th tergite with a sharp spine on each side, the margin between gently rounded, on each side of the middle with a pair of closely approximated blunt processes ; 6th sternite a little produced and rounded.

Luzon : Imugan. A single specimen. Type in my collection.

Stenomastax pustulata, sp. n.
(Bernh. *in litt. Homalota*).

Head black, shining, thorax dark reddish brown, greasy lustrous ; elytra shining, yellow, the reflexed sides (except the shoulders and postero-external angles) and adjacent area of the disc, sutural region for the anterior two-thirds broadly and indeterminately pitchy ; abdomen shining, pitchy, the posterior margins of the first four visible tergites narrowly rufescent, the 5th with the posterior margin broadly yellow, the 6th yellow. Antennæ black, the first three segments and legs reddish yellow. Length 2 mm.

Build of *platygaster* Kr., but more robust and with much stouter antennæ, readily recognised by the elytral colour-pattern. Head strongly coriaceous, the punctures close, much larger and deeper than in *platygaster*. Antennæ short and stout, the 3rd segment as long as the 2nd, 4th to 10th gradually more transverse, the penultimate about three times broader than long. Thorax transverse (3·5 : 2·5), broadly impressed along the middle, coriaceous, the punctures close, but much finer and more superficial than on the head. Elytra longer (3·5 : 2·5) and broader than the thorax, finely, moderately closely and superficially punctured in the basal half, more sparingly behind. Abdomen parallel, finely and rather closely punctured at the bases of the first three visible tergites, much more sparingly elsewhere.

♂ : 7th tergite along the posterior margin finely and closely granular ; 8th with a sharp spine on either side, the middle forming a plate with truncate apex, not produced beyond the level of the lateral spines.

Mindoro : Theodoro. Type in my collection.

Stenomastax insularis, sp. n.
(Bernh. *in litt. Homalota*).

Greasy lustrous ; head black, reddish in front, thorax yellowish red, elytra pitchy, the basal region indeterminately reddish ; abdomen reddish yellow. Antennæ reddish, the 1st segment and apex of the last lighter. Legs reddish yellow. Length 1·5 mm.

Size and build of *variventris* Kr., but differently coloured, the head a little narrower ; more brightly coloured than *cingulata* Cam., and with longer antennæ, the sculpture differing from both. Head slightly longitudinally impressed along the middle, coriaceous, with fine close, obsolete puncturation, the punctures smaller and less distinct than in either of the above-mentioned species. Thorax rather broadly impressed along the middle, coriaceous, with close obsolete puncturation finer than that of the head. Elytra with fine close puncturation, finer than in *variventris* or *cingulata*. Abdomen finely coriaceous, finely and rather closely punctured.

Siargao : Dapa. A single specimen. In my collection.

Stenomastax parallela, sp. n.
(Bernh. *in litt. Homalota*).

Rather shining, head black, thorax and abdomen bright yellowish red, the latter with the 4th visible tergite black ; elytra pitchy, with the basal area indeterminately reddish. Antennæ reddish, the first two segments and legs reddish yellow. Length 1·8 mm.

Fore parts of the same colour as in *insularis* Cam., but more parallel, much more shining, less strongly coriaceous, the antennæ shorter and stouter. Head coriaceous, with rather close flat obsolete punctures, the eyes smaller than in *insularis*. Antennæ shorter, the penultimate segments three times broader than long. Thorax more transverse (2·75 : 2), the sides more strongly retracted behind, broadly superficially impressed along the middle, finely coriaceous, much less strongly than in *insularis*, finely, rather closely punctured, the punctures much more evident owing to the weaker ground-sculpture. Elytra longer than the thorax (3 : 2), longer than *insularis*, very finely, closely punctured as in that species. Abdomen parallel, much less closely punctured than in *insularis*, especially behind.

Luzno : Balbalan. A single specimen. In my collection.

Chledophila angusta, sp. n.
(*Homalota angusta* Bernh. *in litt.*).

Rather dull, yellowish red, the 4th visible tergite slightly infuscate. Antennæ and legs reddish yellow. Length 1 mm.

Very similar in build to *annularis* Cam., but smaller, the elytra lighter, the antennæ shorter, the 3rd segment distinctly shorter than the 2nd. but otherwise of similar structure; eyes smaller, the ground-sculpture of the head similar, the puncturation as close but finer. Thorax shorter, more transverse (2 : 1·5), the puncturation as close but not so fine as in *annularis*. Elytra as long as the thorax, less finely and more roughly punctured than in that species. Abdomen as closely but more finely punctured than in *annularis*.

Siargo : Dapa. A single specimen. In my collection.

Neomalota philippina, sp. n.

Fore parts rather dull, abdomen more shining. Head dark red; thorax lighter red; elytra reddish, extensively infuscate laterally; abdomen reddish yellow, the 3rd and 4th visible tergites blackish. Antennæ brown, the first two segments reddish yellow, the 11th reddish. Legs reddish yellow. Length 2 mm.

Very near *cingulata* Cam. (*cameroni* Bernh., Scheerp.), but more brightly coloured, the antennæ longer, the elytra less shining, more roughly punctured externally. The eyes are smaller, but the puncturation of the head scarcely differs, the antennæ have the 4th and 5th segments longer and the penultimate as long as broad. Thorax broader, more finely but roughly punctured, more convex and without trace of lateral impression. Elytra closely and roughly punctured externally, on the disc with several small scattered punctures as in *cingulata*. Abdomen rather less finely punctured on the first two visible tergites, scarcely differing from *cingulata* on the following, and in other respects similar to that species.

Siargao : Dapa. Type in my collection.

MINDORIA, gen. nov. (Bernh. *in litt.*).

This genus appears to be allied to *Anomognathus* Gemm. Har., but is at once distinguished by the narrow parallel cylindrical build, longer and more slender tarsi, the abdomen with only the first two visible tergites transversely impressed at their bases and as long as the fore parts. Owing to lack of material for dissection I am unable to give details of structure.

Mindoria paradoxa, sp. n. (Bernh. *in litt.*).

Narrow, parallel, shining; head black, thorax reddish yellow, elytra brownish yellow, obscurely infuscate about the scutellum and postero-external regions; abdomen with the first two visible tergites, the posterior margin of the 5th and whole of the 6th reddish yellow. Antennæ and legs reddish yellow, the last four segments of the former infuscate. Length 1·75 mm.

Head short oval, slightly longer than broad, very slightly narrower than the thorax, the eyes moderate, distinctly shorter than the post-ocular region, with a few small very obsolete scattered punctures and fine longitudinal striate ground-sculpture. Antennæ short and stout, the 1st segment as long as the 2nd, 3rd small, transverse, 4th and following gradually increasing in width, the penultimate about three times broader than long, the 11th short, pointed. Thorax longer than broad (2 : 1·5), the sides straight and almost parallel, the anterior and posterior angles briefly rounded, on each side of the middle with a long narrow parallel obsolete impression extending from the base almost to the anterior border, the sculpture as on the head. Elytra parallel, slightly longer (2·3 : 2) and very slightly broader than the thorax, not emarginate postero-externally, the sculpture as on the thorax. Abdomen elongate, very slightly widened behind, the first four visible tergites practically impunctate and without ground-sculpture, the 5th and 6th with a fine coriaceous ground-sculpture. The 6th is produced in the middle as a long sharp upturned spine, on each side with a short incurved sharp tooth separated from the median spine by a deep arcuate emargination; 6th sternite a little produced, narrowed and bluntly pointed, less produced backwards than the median spine (? ♂). The whole insect practically glabrous.

Mindoro: S. Theodoro. A single specimen. In my collection.

Tachychara flavipennis, sp. n.
(Bernh. *in litt. Gnypeta*).

Moderately shining; head black; thorax dark reddish brown; elytra yellow; abdomen dark brown. Antennæ black, the first three segments and legs reddish yellow. Length 3 mm.

Much like *discipennis* Cam., but at once distinguished by the uniformly yellow elytra, not at all infuscate at the base, the antennæ are longer and more slender, reaching nearly to the posterior margin of the elytra, all the segments longer; the head is as closely but much more finely and superficially punctured. Thorax transverse (4·5 : 3·75), the sides more sinuate behind and the posterior angles more prominent than in *discipennis*, along the middle for the posterior two-thirds broadly and superficially impressed, the disc with four small quadrately-placed punctures, the general puncturation as close but finer than in *discipennis*. Elytra broader and slightly longer than the thorax, as closely but more finely punctured than in that species. The abdomen as closely but much more finely punctured than in *discipennis*.

♂: 6th sternite produced, slightly narrowed and broadly rounded.

Luzon: Balbalan. Type in my collection.

From Borneo (Mt. Pais) and the Malay Peninsula comes a form only differing from the above in the elytra having the reflexed margin nearly to the postero-external angle and the whole base extensively infuscate, so that in colour it resembles *discipennis*, the middle and posterior femora infuscate; in sculpture and antennal structure as in *flavipennis*. Var. *bryanti*, n.

(To be continued.)

XXXII.—*New Species of Indian* Chrysomelidæ (*Coleopt.*). By G. E. Bryant, F.R.E.S. (Entomological Assistant, Imperial Institute of Entomology).

The types of the following new species will be deposited in the British Museum, and paratypes to the Forest Research Institute, Dehra Dun.

CRYPTOCEPHALINÆ.

Cryptocephalus gardneri, sp. n. (Fig. 1.)

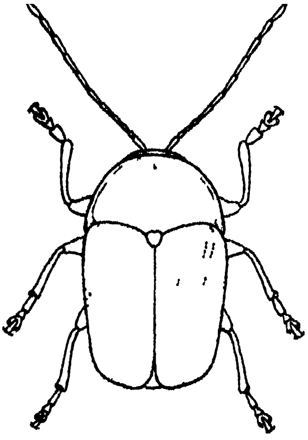
Black, the underside, legs and antennæ flavous, the anterior margin narrowly and the side margins of the

prothorax widely flavous, the prothorax nitid and impunctate, the elytra punctate-striate.

Length 4 mm.

Head black, rugosely punctured, a longitudinal median impression between the eyes. Antennæ flavous, long and slender, extending to the middle of the elytra, the four terminal segments slightly thickened and tinged with fuscous. Prothorax transverse, the sides rounded and contracted in front, nitid, impunctate, black, with the anterior margin narrowly flavous, the side margins more widely flavous (in some specimens the prothorax has a median longitudinal flavous stripe). Scutellum black, nitid, impunctate, triangular. Elytra black, nitid, broader at their base, gradually tapering to the apex, strongly punctate-striate, the shoulders somewhat prominent and impunctate. Legs flavous, the anterior and middle pairs with the basal segment of the tarsi enlarged. Underside and the pygidium flavous.

Fig. 1.



Cryptocephalus gardneri, sp. n.

INDIA: Jawalagiri, North Salem, 13. viii–5. xii. 1930 (Forest Research Institute, Sandal Insect Survey), Nos. 649–654.

Allied to *C. insubidus*, Suff., but less parallel-sided, the pygidium less exposed, and the colour of the elytra appears to be constant.

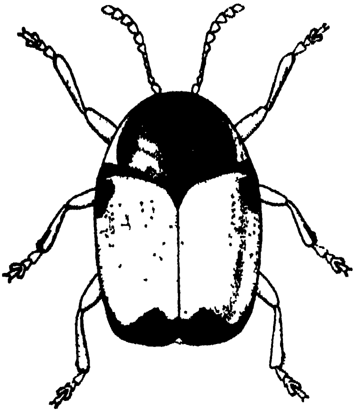
Melixanthus coorgensis, sp. n. (Fig. 2.)

Black, the elytra flavous, with a black humeral spot, and the apex black, prothorax with the sides flavous, antennæ with the five basal segments flavous.

Length 2 mm.

Head flat, black, finely and rugosely punctured. Antennæ short, not extending to the hind margins of the prothorax, the five basal segments flavous, the six terminal segments black, the first segment more than twice as long as the second, the second ovate, the following three narrower, the six terminal strongly widened, almost triangular. Prothorax black, nitid, the sides flavous, sparingly and very finely punctured, widest at the base, gradually narrowed towards the front. Scutellum black, triangular, impunctate. Elytra flavous, the shoulders with a black spot, and the apex black, finely punctate-striate, widest at their base, gradually narrowed to the apex. Legs black. Underside black, the apical ventral segment deeply notched in the female.

Fig. 2.



Melixanthus coorgensis, sp. n.

India : Fraserpet, Coorg, 11. vii. 1930 (Forest Research Institute, Sandal Insect Survey), 2 specimens.

Somewhat allied to *M. humeralis*, Jac., but differs in colour, and the sides of the elytra not margined with black.

EUMOLPINÆ.

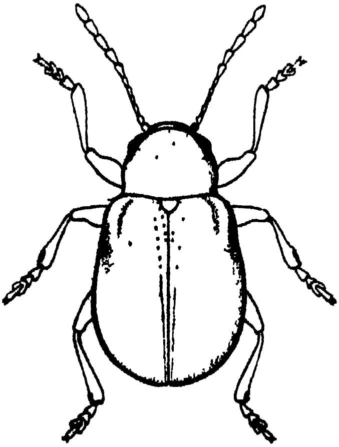
Cleoporus phyllanthi, sp. n. (Fig. 3.)

Head and prothorax fulvous, elytra black, the four basal segments of the antennæ and legs fulvous.

Length 3 mm.

Head impunctate, the frontal half fulvous, the basal part black, the vertex with a short longitudinal central impression. Antennæ extending a little beyond the base of the elytra, the four basal segments fulvous, the remainder black, the two basal segments more swollen, the four following about equal to each other and more slender, the five terminal segments slightly thickened. Prothorax fulvous, nitid, very convex, the sides straight, the anterior angles very prominent and acute, strongly but not closely punctured. Scutellum black, nitid, impunctate, subtriangular. Elytra black, nitid, punctate-striate, the punctures somewhat widely spaced, slightly wider at the base than the prothorax, subcylindrical, rounded at the apex. Legs fulvous, the four posterior tibiæ emarginate at their apices; claws bifid. Underside: the prosternum fulvous, meso- and metasternum and ventral segments of the abdomen black.

Fig 3.



Cleoporus phyllanthi, sp. n.

BURMA: Maymyo, vi. 1924 (*C. R. Robbins*), 5 specimens. Feeding on *Phyllanthus* sp.

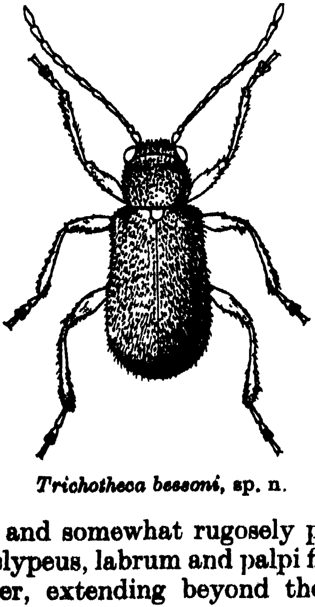
Allied to *C. lefevrei*, Duv., but differs in not being metallic, and without any trace of greenish æneous.

Trichotheca beesoni, sp. n. (Fig. 4.)

Elongate, parallel-sided, dark fuscous, except the antennæ, clypeus and legs flavous, clothed with grey pubescence, head and prothorax rugosely punctured, elytra somewhat strongly punctate-striate.

Length 3 mm.

Fig. 4.



Trichotheca beesoni, sp. n.

Head closely and somewhat rugosely punctured, finely pubescent, the clypeus, labrum and palpi flavous. Antennæ long and slender, extending beyond the middle of the elytra, flavous, the two basal segments more dilated and shorter than the remainder, the third longer than the second, the fourth slightly longer than the third, the five terminal segments a little shorter and slightly thickened. Prothorax about as wide as long, dark fuscous, rugosely punctured, clothed with fine grey pubescence, the sides contracted at the base, less so in front, at its widest as wide as the head with the eyes. Scutellum transverse, dark fuscous, impunctate. Elytra dark fuscous, clothed with grey pubescence, the sides almost parallel and rounded at the apex, rugosely punctate-striate, the punctures feebler towards the apex, much wider at its base than the prothorax. Legs flavous, the tibiæ clothed with pubescence, the anterior femora with a feeble tooth beneath. Underside fuscous, the ventral segments of the abdomen about equal.

INDIA: Batote, 5500 ft., Udhampur, Jammu Province, 6. v. 1928 (*C. F. C. Beeson*), Nos. 255–257, 3 specimens.

Allied to *T. fusca*, Jac., but very much smaller and more parallel-sided. The smallest known species of the genus.

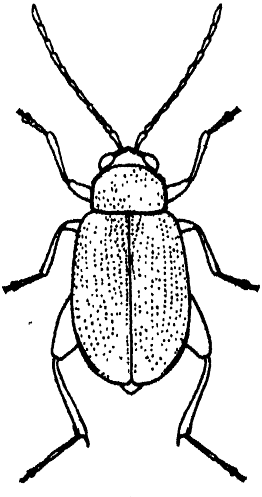
HALTICINÆ.

Longitarsus taklechensis, sp. n. (Fig. 5.)

Body oblong, colour bronze-black, the legs and antennæ pale flavous, except the five apical segments of the antennæ and hind femora tinged with fuscous.

Length 2 mm.

Fig. 5.



Longitarsus taklechensis, sp. n.

Head bronze-black, impunctate, the basal portion slightly rugose. Antennæ extending to the middle of the elytra, pale, flavous, except the five terminal segments which are tinged with fuscous, the first segment much longer than the second, both of which are stouter than the third to the sixth, the five terminal segments slightly thickened and tinged with fuscous. Prothorax bronze-black, broader than long, the sides straight with the anterior angles oblique, finely and rugosely punctured. Scutellum small, triangular. Elytra bronze-black, slightly broader than the base of the prothorax, the sides from behind the middle gradually rounded to the apex, somewhat finely punctate-striate. Legs pale, flavous, the posterior femora with the apical half fuscous, the first segment of the posterior tarsi about half the length of the tibiæ, the posterior tibiæ with a small well-developed spine at the apex. Underside black, nitid, the first ventral segment the longest, the second to the fourth about equal, very finely punctured.

INDIA: Taklech, Bashahr State, 5500 ft., 14. iv. 1928 (*R. N. Parker*), 2 specimens.

This is only the second metallic species of *Longitarsus* to be described from India, and is not very closely related to any described species. It may be placed near *L. singhala*, Mlk.

Chætocnema merguiensis, sp. n.

Body ovate, shining coppery green, the four basal segments of the antennæ and legs flavous, the terminal segments of the antennæ fuscous, the posterior femora dark metallic green.

Length 3 mm.

Head metallic coppery green, somewhat convex, deeply but not closely punctured, the punctures being stronger towards the base. Antennæ extending slightly beyond the middle of the elytra, the four basal segments flavous, the fifth with the basal half flavous, the remainder fuscous; the first segment twice as long as the second and more dilated, segments three to five more slender, the fifth the longest, sixth to the eleventh about equal and slightly more thickened than the fifth. Prothorax bright coppery green, transverse, the sides feebly rounded and margined, contracted in front, surface very minutely granulose, strongly but not closely punctured, the punctures being finer towards the anterior margin. Scutellum coppery green, triangular, impunctate. Elytra shining coppery green, broadly ovate, narrowed towards the apex, strongly punctate-striate, the punctures being finer towards the apex. Legs flavous, except the posterior femora, which are metallic green, clothed with fine short pale pubescence, the middle and hind tibiæ strongly emarginate towards the apex. Male with the first segment of the anterior tarsi strongly dilated, all the tarsi with the apical segment tipped with fuscous. Underside clothed with short fine ashy pubescence.

BURMA : Mergui, i 1927 (*R. N. Parker*), 2 males.

Allied to *C. cognata*, Baly, but much larger, colour more brilliant, and legs flavous.

Podagrica apicefulva, sp. n.

Body ovate, tapering at the apex, convex, fulvous, the elytra blue-black with the apex fulvous, antennæ with the five basal segments fulvous and the six terminal segments black, prothorax very finely but not closely punctured, the elytra with finely punctured irregular double rows.

Length 4 mm.

Head fulvous, the vertex convex, impunctate, an oblique impression near the inner margin of the eyes. Antennæ extending just beyond the base of the elytra, the five basal segments fulvous, the remainder black, the first segment twice as long as the second, the third slightly longer than the second, the third to the tenth all about equal, the terminal segment longer than the tenth, the six terminal segments pubescent. Prothorax fulvous, transverse, very finely but not closely punctured, the sides rounded and narrowed in front, the anterior angles rounded ; on each side is a short longitudinal impressed line, perpendicular to the anterior margin, formed by three large punctures, and on the basal margin a very short impression placed opposite to the anterior impression. Scutellum fulvous, impunctate, sub-triangular. Elytra blue-black, with the apex fulvous, the surface finely punctured in irregular double rows, widest a little behind the middle, thence tapering to the apex. Legs fulvous. Underside fulvous, the first ventral segment of the abdomen twice as long as the second, the second very little longer than the third, and the third and fourth about equal, very finely and not closely punctured, clothed with short pubescence.

INDIA : Madras, Chalomborai, 13. x. 1925, 3 ♀♀ (*S. N. Chatterjee*) ; Malabar (Fry Coll., British Museum), 1 specimen.

Reported defoliating *Urena sinuata.*

Allied to *P. nigripennis*, Jac., but differs in colour, the elytral striæ very much stronger, and the fulvous apex to the elytra distinguishes it from the Indian species.

Aphthona archeri, sp. n.

Oblong, metallic dark blue, the underside black, antennæ and legs piceous, the three basal segments of the antennæ more or less flavous, the anterior and middle legs with the base of the tibiæ flavous. Prothorax very finely but not closely punctured. Elytra more strongly and closely punctured.

Length 2 mm.

Head metallic blue, practically impunctate, the front clothed with grey pubescence, palpi piceous, antennal tubercles well developed. Antennæ extending to about the middle of the elytra, piceous, except for the basal segment, with the apical part flavous and the second and third flavous, the first segment nearly twice as long as the second, the second and third both about equal, the fourth a little longer than the third, the fifth distinctly longer than the fourth, the fifth to the eleventh about equal. Prothorax metallic dark blue, very finely but not closely punctured, transverse, the sides rounded and the anterior angles oblique. Scutellum blue-black, impunctate, triangular. Elytra metallic dark blue, more strongly and closely punctured than the prothorax, the sides nearly parallel, rounded at the apex. Legs piceous, the anterior and middle pairs, the femora with the apical portion flavous, and the tibiæ with the basal portion flavous, the posterior pair with the femora blue-black, slightly metallic, and the tibiæ entirely piceous. Underside black.

India: Bengal, Darjeeling, 6000 feet, 18. ix. 1929 (*J. C. M. Gardner*), 1 specimen; Himalaya, Almora District, 6000 to 7000 ft., 1920 (*S. R. Archer*), 1 specimen.

Allied to *A. indica*, Jac., but differs in the dark blue colour, legs and antennæ dark, prothorax more transverse and rounded, and the punctuation finer.

Aphthona parkeri, sp. n.

Oblong-ovate, convex, black nitid, the head, prothorax and two basal segments of the antennæ flavous, head and Prothorax impunctate, elytra finely punctate-striate.

Length 2 mm.

Head flavous, impunctate, antennal tubercles and inter-antennal carina well marked. Antennæ extending not quite to the middle of the elytra, the two basal segments flavous, the remainder fuscous, the first segment about twice as long as the second, both more dilated than the third and fourth, the seven terminal segments about equal to each other but rather more dilated. Prothorax transverse, flavous, impunctate, the sides nearly straight and margined, the anterior angles oblique. Scutellum black, impunctate, triangular. Elytra black, nitid, wider than the base of the prothorax, the sides almost parallel, rounded at the apex, finely punctate-striate, slightly depressed behind the shoulders. Legs fulvous, with the hind femora black. Underside with the prosternum flavous, the remainder black.

Burma: Tavoy, i. 1927 (*R. N. Parker*), 2 specimens.

Allied to *Crepidodera collaris* Baly, from Shanghai, but differs in its smaller size, darker legs, prothorax less transverse and the sides not so rounded, and in the basal segments of the antennæ with two, not five, segments flavous.

Crepidodera collaris Baly, 1877, must be transferred to the genus *Aphthona*, as there is no basal impression on the prothorax. The name is preoccupied by *Aphthona collaris* Baly, 1874, from Japan, so I propose *A. balyi*, n. n. for the 1877 species. At present there is only one Indian species with this colouring, namely *A. hugeli* Jac., which is nearly twice as large, and more glabrous.

Aphthona gardneri, sp. n. (Fig. 6.)

Oblong, metallic green, the antennæ and legs fulvous, tinged with fuscous, head nitid, with a few large punctures near the inner margin of the eyes, prothorax nitid, impunctate, elytra finely and irregularly punctured.

Length 1·75 mm.

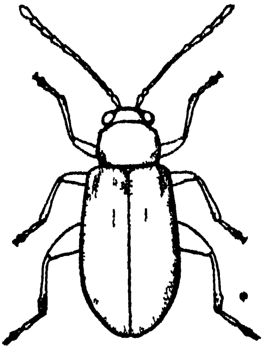
Head metallic green, nitid, a few large punctures near the inner margin of the eyes, the inter-antennal carina well marked. Antennæ long and slender, extending to the middle of the elytra, fulvous, with the eight terminal segments tinged with fuscous, the first segment nearly twice as long as the second, the third and fourth each a little longer than the second, the seven terminal segments all about equal and each a little longer than the fourth.

Prothorax metallic green, nitid, impunctate, the sides rounded and narrowly margined, the anterior angles oblique. Scutellum metallic green, impunctate, triangular. Elytra metallic green, the sides parallel and rounded at the apex, rather finely and irregularly punctured. Legs fulvous, the femora and tarsi tinged with fuscous. Underside dark metallic green.

INDIA: Darjeeling, Lopchu, 5000 feet, 22. ix. 1929 (*J. C. M. Gardner*), 2 specimens.

Somewhat allied to *A. indica* Jac., but not such a bright metallic green, the legs darker, the sides of the prothorax more rounded.

Fig. 6.



Aphthona gardneri, sp. n.

Elytropachys sandalensis, sp. n.

Broadly ovate, not very convex, brownish testaceous, with a greenish tinge on the elytra, the antennæ, the three apical segments excepted, and legs flavous, head and prothorax impunctate, the elytra strongly but somewhat irregularly punctate, more or less arranged in longitudinal rows.

Length 2¼ mm.

Head brownish testaceous, impunctate, the frontal elevations feeble. Antennæ flavous, the three terminal segments fuscous, not extending to the middle of the elytra, the first segment elongate, about equal to the second and third together, segments four to ten about equal, the apical segment slightly longer and acuminate. Prothorax brownish testaceous, impunctate, very transverse, widest at the base, the sides narrowly margined, slightly contracted in front. Scutellum brown, impunctate, triangular. Elytra distinctly broader at their base than the prothorax, brownish testaceous, with a greenish tinge round the suture, widest about the middle, rounded at the apex, strongly but somewhat irregularly punctured, the punctures more or less arranged in longitudinal rows. Legs flavous, the hind femora tinged with fuscous. Underside brown, the first ventral segment of the abdomen the longest, nearly twice as long as the second.

INDIA: Jawalagiri, North Salem (Forest Research Institute, Sandal Insect Survey), 31. viii. 1930, 22 specimens, Nos. 1394, 1395, 1458–1468, 1472–1474, 1480–1483, 1494, 1513.

Allied to *E. viridescens* Mots.

XXXIII.—*The Lateral Line and related Bones of the Herring* (Clupea harengus *L.*). By THOMAS W. BAMFORD (University College, London).

[Plate IV.]

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INTRODUCTION AND HISTORICAL NOTE.

This work was carried out at the suggestion and under the guidance of Professor D. M. S. Watson, F.R.S., during part of the session 1935–1936.

Since the work of Allis on the cranial anatomy of mail-cheeked fishes (1909) little or no work has been done on the lateral line of Teleosts, either morphologically or embryologically. Moreover, if one believes the statements of Allis (1904) the accuracy of the work previously done is open to question (except, of course, the works of Cole (1896), Pollard (1892), Herrick (1899), and Cole and Johnstone (1901)). This alone provides ample justification for work on the most important member of an economic group, which has, so far as I could gather, never received adequate attention. In only one case (*C. pilchardus*) has the lateral line system of Clupeoids been described in detail, and then for the adult only (Wohlfahrt, 1938).

Of recent years work on the lateral line of fishes has largely been confined to fossils (Watson (1919–), Stensiö (1922–), Goodrich (1919–), Säve-Söderbergh (1933) etc.), and this has had little direct bearing on the modern Teleostei.

There is an abundance of literature concerning the development of the chondrocranium of Teleosts, among which the works of Huxley and Parker, Parker (1873–), Pehrson (1922), Berrill (1924), Allis (1889), and de Beer (1922–) are prominent. The dermal skeleton, however, has not received the same interest, and the embryological work is largely limited to the papers of Allis (1897–), Kindred (1919–), Parker (1873–), de Beer (1924–), and Pehrson (1922).

In particular the adult skull of Clupeoids was the subject of an exhaustive study by Ridewood (1904), while the development of the chondrocranium of *C. harengus* was investigated by Wells (1922).

MATERIAL AND METHOD.

Early stages of the herring were obtained from Plymouth These varied in length from 33 to 50 mm. (overall length, including the lepidotrichia of the tail), and sections 10 μ in thickness were cut of specimens 33, 42, and 50 mm. in length. Later, by way of verification, portions of the skin of adult herrings were fixed and sectioned. The whole series were stained by the hæmatoxylin-eosin method.

Detailed graphic reconstructions of the lateral line and dermal bones of the head of the 33 and 50 mm. stages were made, and the intermediate stage sections were used in corroboration and in the investigation of the transition from one to the other. A reconstruction of the chondrocranium of the earliest stage was also made, and used as a check on the work of Wells (1922).

Heads of adult herrings (freshly fixed on the trawler) were obtained from Plymouth, and attempts made to show the surface organs by spraying with hot picric and chromic acids. The results were generally satisfactory, although in certain areas, especially on the dorsal surface, the extensive development of the pigment obscured the effect.

In addition adult herrings were obtained, the head injected at the supra-infraorbital canal junction, and the canals traced. Various injection fluids were used with varying success, the more successful being methylene blue gelatin, Chinese ink gelatin, carmine vinylite, and vinylite. The Chinese ink and methylene blue methods showed up the canals in detail and also many of the organs, but failed in the deeper structures and the relation of the canals to the bones. With respect to the latter the vinylite procedure (used for capillaries by Dr. Narat of the University of Illinois) was perfect, revealing the exact relationship of the canal and bone once the flesh had been dissolved in potash. The process could be carried a stage further and the bones dissolved in dilute hydrochloric acid, leaving the canals as a model in vinylite.

Finally, skeletons of *Clupea harengus* were prepared, and the drawings used in the reconstructions.

NOMENCLATURE.

(a) *Canals.*—The accompanying diagram (based on the plan of Säve-Söderbergh) illustrates the nomenclature to be used in this paper.

(b) *Bones.*—In general the bones are labelled in the manner adopted by Ridewood in his account of *Clupea finta* (1904). It must be emphasized at this point that the use of the same names does not imply that the bones in the otic and postotic areas and those similarly named in the higher vertebrates are homologous.

DESCRIPTION.

A. *Canals, Pit-lines, etc.*

(1) *Supraorbital Canal.*—In the earliest stage investigated this canal is represented by two portions, one

anterior and isolated and the other continuous with the main infraorbital canal, the position of the future intermediate portion being marked by a groove. At 33 mm. the anterior opening of the canal is in front and mesial to the nostrils, a groove which continues the canal forward closing in later stages until the canal extends well in front of them (figs. 2, 4). In the earliest stage investigated the anterior portion contains one and the posterior two sense-organs, both portions are associated with the frontal, and it is only later, with the formation of the nasal, that the anterior end of the canal is enclosed. At this time there are no tubules, but by the 50 mm. stage a complete supraorbital canal with eighteen pores has developed and the posterior tubule and posterior dilatation are already laid down. The posterior tubule with three pores (in the 50 mm. fish) elongates in the adult into a complicated structure with twelve or more branched tubules having twenty or more pores to the

Fig. 1.

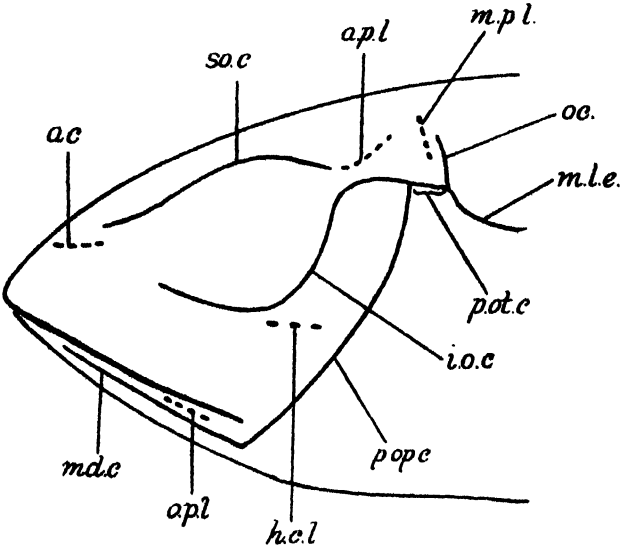


Diagram of canal-system etc. found in fishes.

exterior. Behind this posterior tubule two tubules are given off dorsally, the last one curving round posteriorly, narrowing, and suddenly swelling into a huge sac, which I have called the posterior dilatation. This structure has three pores at its lower, hind margin, and possesses a single organ at the hinder end, lying on the inner wall

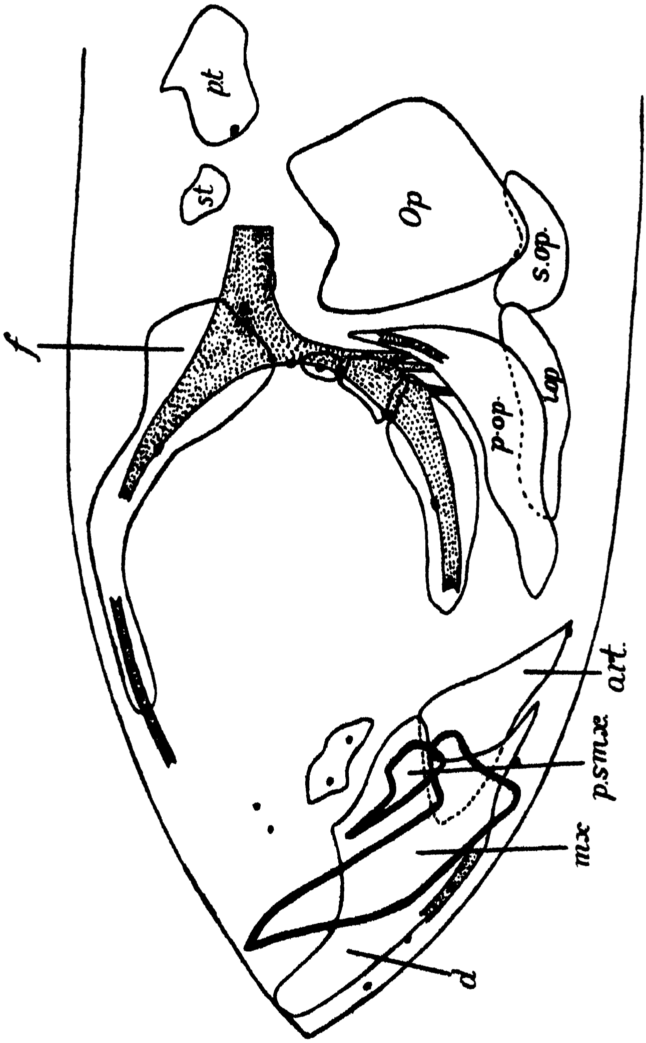
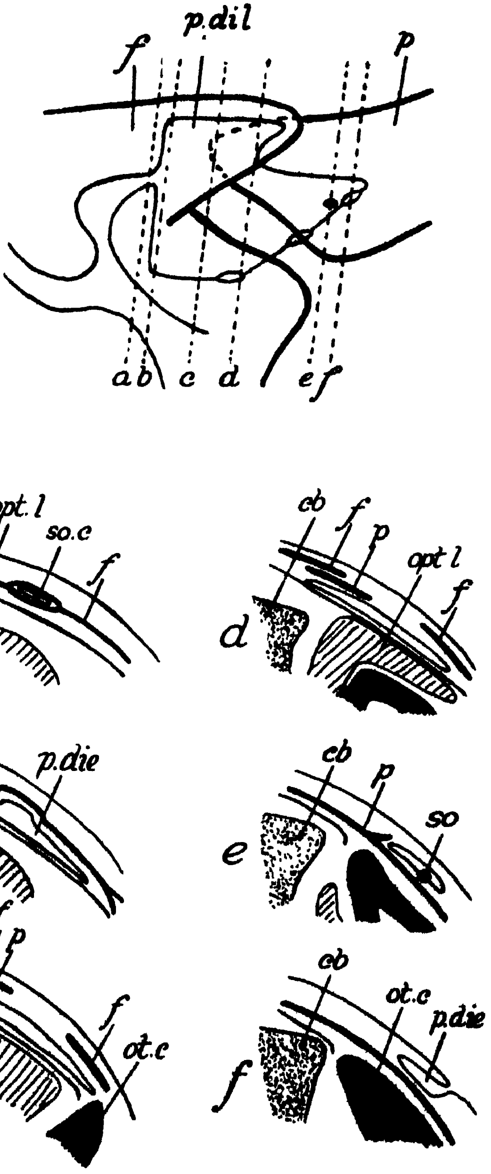


Fig. 2.

Reconstruction of the cranial region of the 33 mm. stage (*Clupea harengus*) showing bones, canals, and organs in relation to one another (upper jaw-bones shown in thick outline). Length of head to hind edge of operculum 5·4 mm.

Fig. 3.

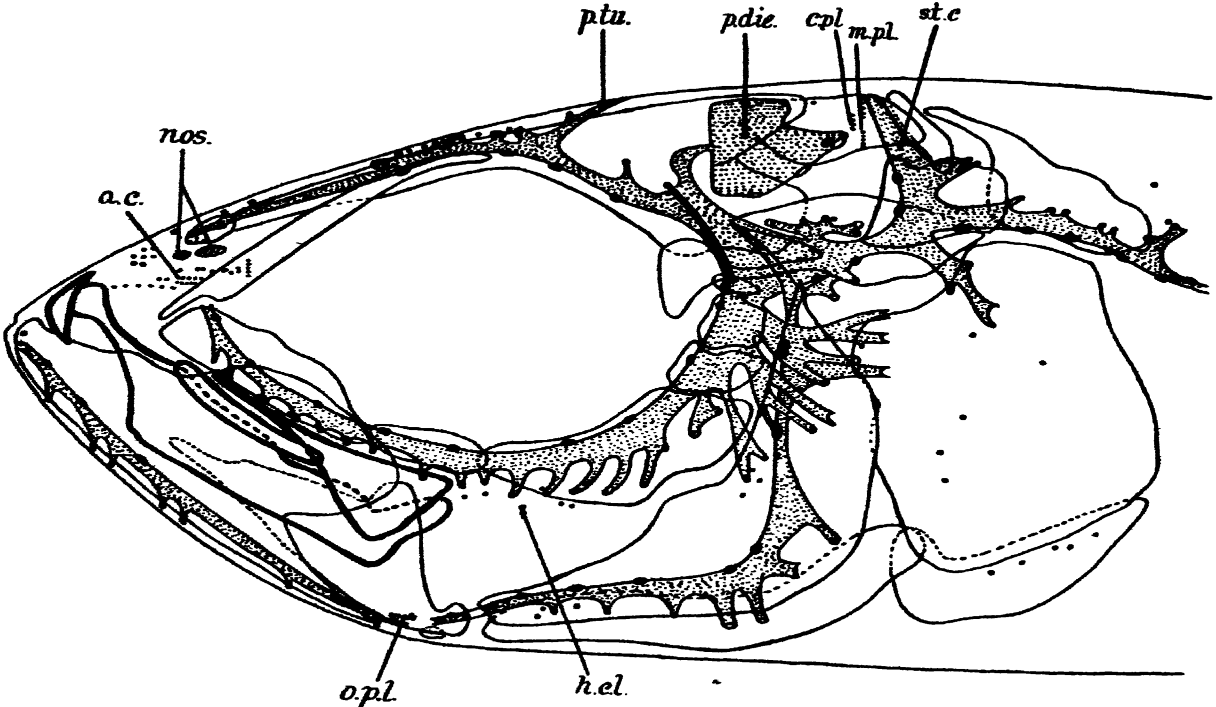


Side view of posterior dilatation, with the positions of the accompanying sketch-sections.

of the sac and in relation to the most posterior of the pores (fig. 3). This structure is remarkable for the fact that at the actual point of dilatation it breaks through the frontal to lie on the inner surface of that bone, immediately above the optic lobes of the brain. The hind and mid portions of this dilatation lie over the otic capsule, but in the mid region the lateral portions of the optic lobes project upwards and laterally to lie between the dilatation and the cartilage of the otic region. Consequently in this region nothing separates brain from canal except the canal wall itself and the lining of the brain cavity—the "dura mater." This cavity also lies on the inside of the anterior part of the parietal (which is here below the frontal), but posteriorly that bone splits into two sheets, the lower of which persists until it comes to lie on the inner side of the dilatation. The matter will be made clear on reference to fig. 3. The three dilatational pores are represented in the adult by complicated branched tubules.

It is only on the free surface that new organs are laid down, so that in this case the five organs found in the complicated canal of the 50 mm. stage are also found in the corresponding positions in the adult. There is, however, a slight change in the position of the organs with respect to the canals, for whereas the two anterior ones of the 33 mm. stage are situated on the innermost surface, in the 50 mm. fish they are already in their adult position on the lower (ventral) edge of the canal. (For comments on the position of the canal organs of this fish see discussion.)

(2) *Infraorbital Canal.*—In the 33 mm. stage this already runs as a continuous structure from below the eye to the anterior dorsal margin of the operculum. Later the canal stretches backwards towards the tail and forward towards the nostril region. In the orbital portion of this early stage we see three tubules given off ventrally, *i. e.*, away from the eye, and five organs on the upper (dorsal) edge of the canal. Here again there is no increase in the number of organs in the canal, since the 50 mm. and adult contain the same number, and, moreover, their association with the underlying bones remains constant throughout (figs. 2, 4). The anterior portion of this canal is absent in the earliest stage, and only two



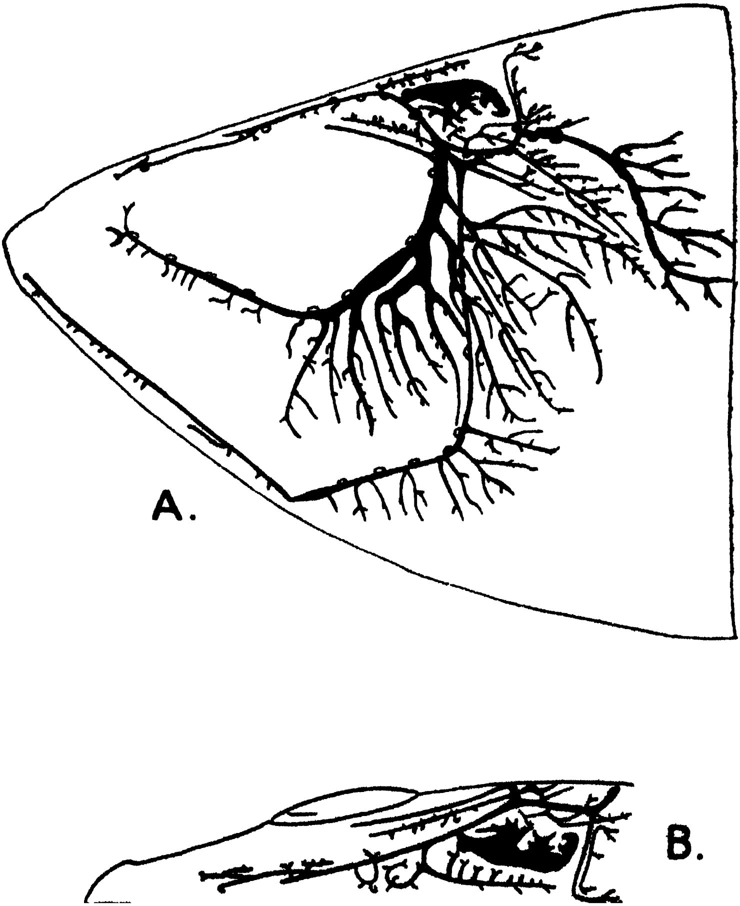
Reconstruction of the cranial region of the 50 mm. stage, with bones, canals, and organs (upper jaw-bones in thick outline). Length of head to hind edge of operculum 11·4 mm.

large surface organs were detectable in the anterior region, both in association with the most anterior of the infraorbital series of bones, the second and sixth bones being absent. Later the distribution of organ : bone for the infraorbital series becomes 3 : 2 : 2 : 1 : 1 : 1. All organs are on the upper (adorbital) edge of the canal. Growth in number and complexity of tubules takes place actively from the 33 to the 50 mm. stages, but beyond this last no new primary tubules are formed, and those already laid down grow and branch, spreading beyond the preopercular canal over the surface of the operculum to form a structure literally riddled with canals (fig. 5). All the tubules so far mentioned are given off away from the orbit, but in the last infraorbital bone region a tubule is given off forwards and upwards to open above the orbit. Absent in the earliest stage, this grows later, elongates, and so far as could be ascertained remains unbranched throughout life. The rest of the infraorbital canal stretches from the junction with the supraorbital to its junction with the preopercular canal. This portion lies horizontally and in the earliest stage possesses one pore ventrally, recognizable (by its position relative to the sense organs) as the point of future junction with the preopercular canal, suggesting that the latter joins a tubule of the main infraorbital canal. Later a dorsal tubule is formed and develops in a triradiate manner. From the beginning a single organ is present in this horizontal section, and later becomes associated with the squamosal (a constant condition for Teleosts), although its position inside the canal tends to alter, since it is placed on the innermost surface at first and ventrally at a later stage (see discussion later). (N.B.—It is uncertain whether the two other organs present here in the 33 mm. stage should really be assigned to the postotic area.)

(3) *Preopercular canal.*—A small simple vertical canal with a single organ, all associated with the upper end of the preopercular, marks the beginning of this canal. Later, growing dorsally, the canal joins the main infraorbital canal, while a branch, continuing above the latter, runs parallel to the corresponding tubule from the infraorbital canal to open to the exterior above the eye. This upper prolongation, however, has no organs, and,

unlike the parallel infraorbital tubule, gives rise to other tubules. Another tubule is also given off close to the infraorbital junction, and lengthens in time to spread

Fig. 5.



A. Side view of head of adult herring injected with Chinese ink gelatin.
B. Dorsal view of A.

downwards and backwards over the operculum. The rest of the canal follows the line of the preopercular to the lower jaw, and can be divided into two parts—

into a more posterior vertical portion which turns forward into a lower horizontal portion leading to the jaw articulation. The vertical canal has three organs with three tubules alternating with them, while the lower horizontal region has four organs with five tubules (50 mm.). All these tubules are given off in a general direction away from the eye. Throughout the canal no new organs are formed once the canals are laid down, while the horizontal portion is the only part to show an increase in the number of tubules joining the canal after the 50 mm. stage.

(4) *Mandibular Canal.*—This is the most distinct and clear of them all, the position being indicated in the earliest forms by a groove (with five organs) closed only in that region about the central organ. Later (50 mm.) the canal closes over almost throughout the whole length of the jaw, enclosing six organs and opening ventrally at seven pores, with one break in the canal immediately anterior to the jaw articulation. The number of tubules increases until a minimum of fourteen pores (from unbranched tubules) can be detected in the adult.

Fig. 6.

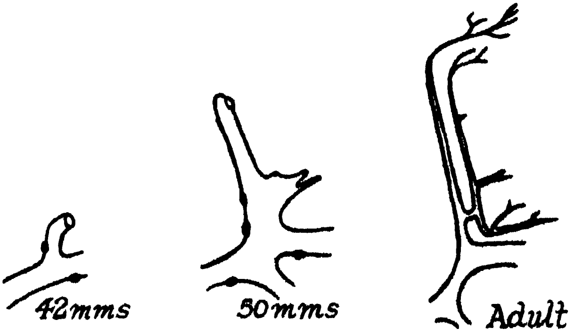


Diagram to illustrate the growth of the occipital cross commissure.

(5) *Postotic Canal.*—This short stretch contains two organs present throughout, while the only tubule spreads ventrally backward and downward, ramifying throughout the entire upper edge of the operculum.

(6) *Occipital Cross Commissure.*—The accompanying diagram illustrates the growth of this canal from its first beginnings in the 42 mm. stage. The adult condition

is merely an elaboration of the 50 mm. type with the growth of a posterior tubule parallel to the commissural canal. The two organs present are always associated with the supratemporal, while the parietal portion of the canal, although richly branched, never succeeds in meeting its fellow.

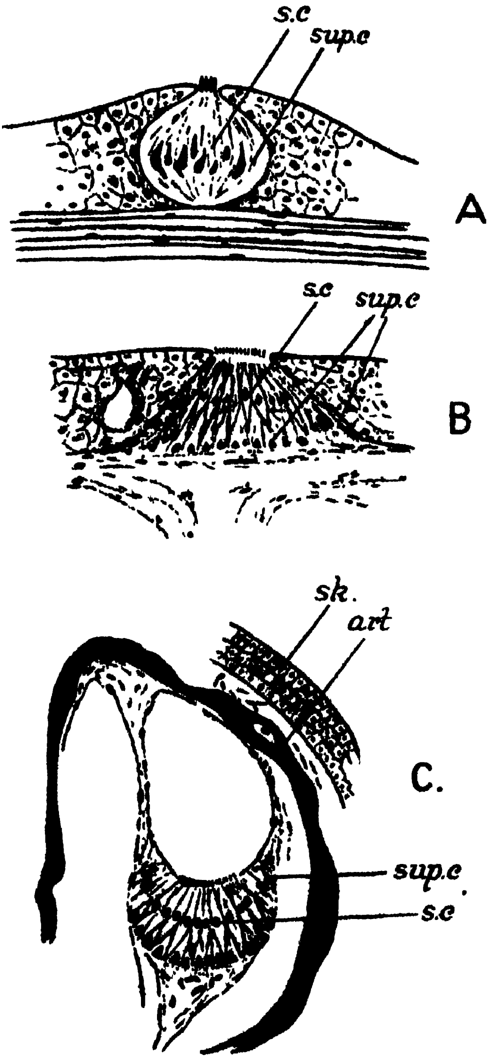
(7) *Main Lateral Line.*—In the main canal developing as a backward growth after the 33 mm. stage we get one organ in the supra- and two in the posttemporal regions, all on the ventral edge of the canal. Posterior to the last-named bone we have a stretch of free canal (not associated with any bone) with four organs, three on the ventral and one, posteriorly, on the dorsal side. Six dorsal tubules, one ventral tubule, and a lateral pore are present in this sector. In the growth to the adult no new tubules are laid down in the cranial region beyond those present at 50 mm., but these branch and pass posteriorly on to the body of the animal.

(8) *Pit-lines, Surface Organs, etc.*—Anteriorly, in the 50 mm. stage, there are groups of sense organs below and in front of the nostrils, and stretching dorsally over the snout, while farther back the organs are arranged in longitudinal lines between the eyes. In the parietal region a transverse pit-line is evident, and also a smaller line and scattered organs anterior to it. Below the infraorbital canal in its suborbital region there is a row of organs spreading as far back as the preopercular canal, while other groups occur in the angle of the jaw and in the lower regions of the operculum. The presence of organs in the above areas was verified in the adult by the normal methods (see under "Method").

B. *Histology of Cutaneous Organs.*

Two main types of cutaneous organs were found. The first, abundant in the pharynx, are the so-called end-buds. Here the organ is bulb-shape, consisting of a globular mass of elongated cells let into the epidermis. These cells are all approximately of the same length and can be divided into two classes—the central ones being sensory, terminating in sensory hairs projecting beyond the outer edge of the oral epithelium, while around the edge of the structure are grouped the non-sensory supporting cells (fig. 7).

Fig. 7.



Sections to show the structure of cutaneous sense-organs in the herring.

A. End-bud from pharynx.
B. Lateral line sense-organ from the middle pit-line.
C. Lateral line organ in the mandibular canal.

The other type of cutaneous sense organ is found exclusively on the epidermis and in the canals, and consists of two types of cells similar to those found in the taste-buds. Here, however, the lower edges are flanged out by the inclusion of tapering supporting cells to form the entire base of the organ. The sensory cells, therefore, are on a higher level and shorter than the corresponding supporting cells. In addition (as for taste-buds) a layer of supporting cells surrounds the inner sensory core. The organs inside the canals are of a similar nature and under the obvious modifications adapted to a circular space—such as the curved form of the base—but apart from this and the fact that they are generally much larger they differ in no way from the organs of the external epithelium (see fig. 7).

C. *Chondrocranium.*

The only reconstruction made was of the 33 mm. stage. Mr. Wells, in his study of the chondrocranium of the larval herring (1922), notes a considerable increase in height between the 30 and 40 mm. conditions. In my case the chondrocranium corresponds in height to his of 40 mm., so that we may assume the transformation in shape of the head to occur between 30 and 33 mm.

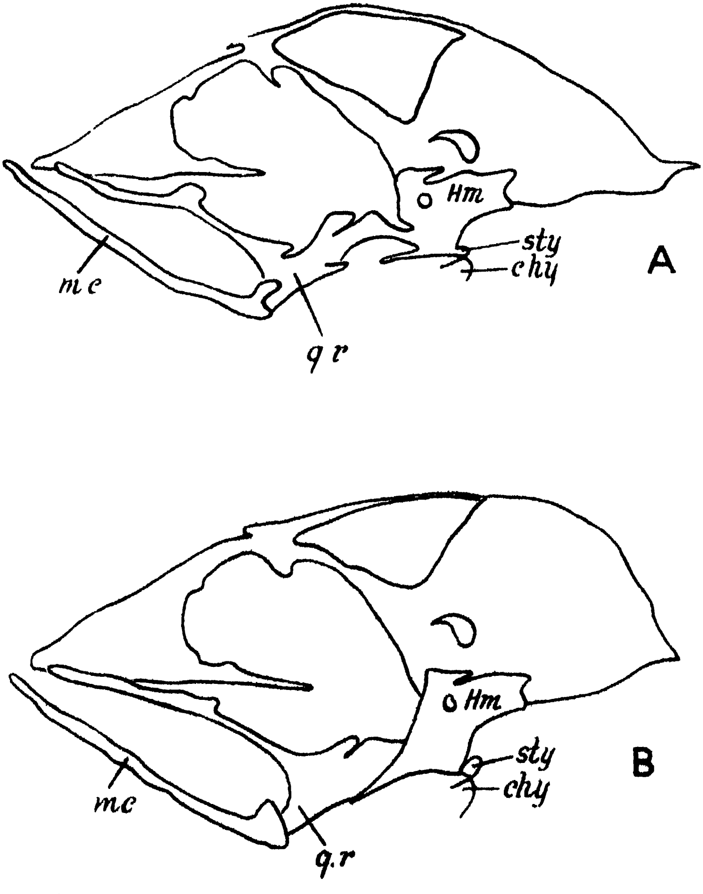
There are only slight differences between the reconstructions of Mr. Wells and myself. In my specimen the hyomandibular was quite distinct from the quadrate region (Mr. Wells shows them to be continuous), but even so the symplectic is in approximately the same position undercutting the anterior cartilage. On the other hand, he shows the cartilage of the hyomandibular and stylohyoid to be continuous, which is not the case in my specimen, nor is the gentle slope at the back of the head a characteristic of the 33 mm. condition. Apart from these points, however, there are no more comments to be made other than have been stated by Mr. Wells (1922).

D. *Dermal Bones, etc.*

(1) *Jaw Bones.*—(Maxilla, premaxilla, supramaxillaries (quadrate), dentary, angular, and articular.)

Upper jaw: In general the jaws are well developed early in life, although the presence of a well-formed supramaxilla before the existence of a premaxilla is a matter of some peculiarity. The only jaw elements added after the 33 mm. stage were the crescent-shaped

Fig. 8

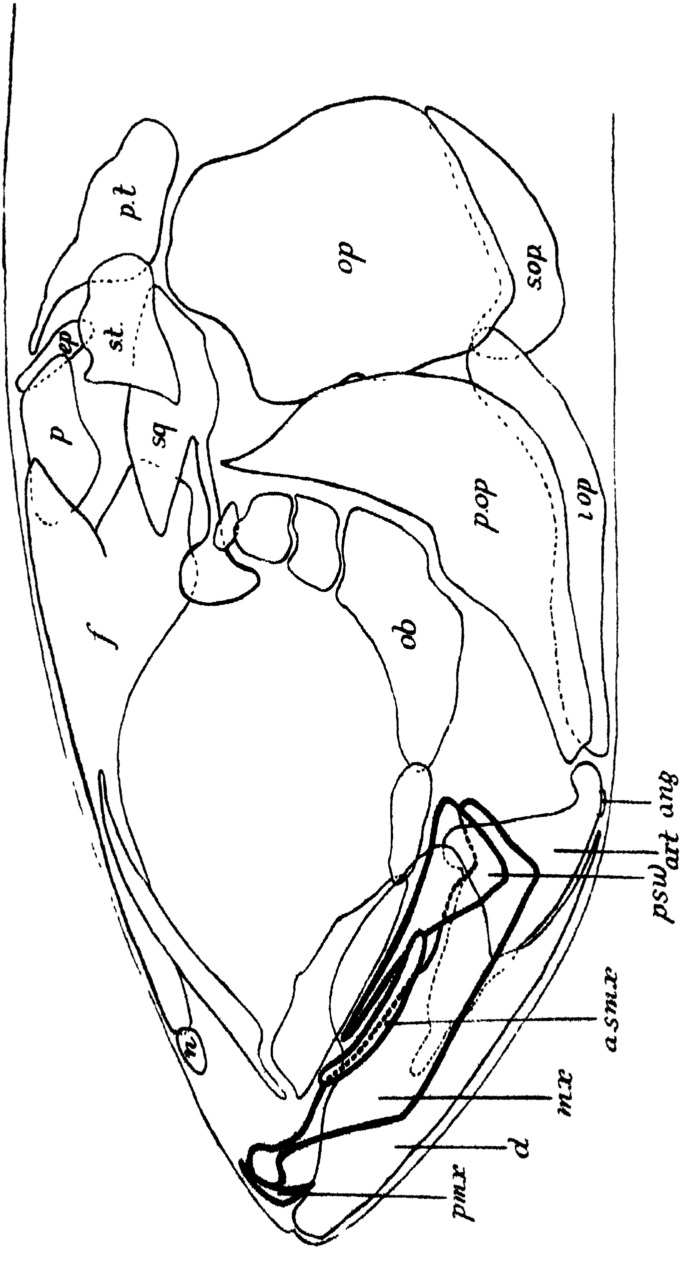


Reconstruction of the chondrocranium of the larval herring.

A. 40 mm. (after Wells).
B. 33 mm.

premaxilla and the posterior supramaxilla, and the 50 mm. fish, which possesses both of these, agrees in the number and shape of its jaw bones with the full-grown

Fig. 9.



As for fig. 4, with canals, organs, omitted.

fish. Teeth appear late in life, three or four being present on the premaxilla and a row of minute teeth on the maxilla.

Lower jaw : Here the last element to be formed is the angular, plastered as it were on the lower, posterior, inner edge of the articular (the only cartilage bone of this region). Apart from this, however, there is little change beyond minor alterations, such as the forward passage of the articular along the inner surface of the dentary, or the formation of the swollen posterior part of the articular at the jaw articulation.

(2) *Orbital Bones.*—As already explained in section A of this paper there are six bones in the infraorbital series, shielding the eye on the ventral side, and of these only four are present at 33 mm. At 50 mm. there is also one supraorbital bone in the anterior region, bridging the gulf between the infraorbital series and the frontal.

(3) *Roofing, "Otic" Bones, etc.*—(Nasal, frontal, parietal, posttemporal, supratemporal, squamosal, epiotic, etc.)

The frontal is well developed in all stages, the chief change being a growth backwards of the forked hinder end to make contact with the parietal above and the squamosal below, both of which bones are non-existent in the 33 mm fish. In addition in the postero-lateral region the frontal is split along its length to accommodate the huge supraorbital canal. The squamosal has a peculiar shape, a narrow rib from the main portion in the otic region passing forward to flange out into a wide plate immediately behind the orbit. The supratemporal and posttemporal are present at 33 mm., but the latter only acquires its characteristic shape with three anterior prongs (one touching the epiotic, another the opisthotic, and the third carrying the lateral line canal to the supratemporal) after this stage.

(4) *Opercular Bones.*—(Opercular, subopercular, interopercular, and preopercular.)

Even in the earliest stage investigated all these bones were in their typical position, and only small modifications take place.

DISCUSSION.

Canals.—The canals are formed by the typical Teleostean method of involution, and the position of the supraorbital canal mesial to the nostril is in accordance with the properties of the group. As in other fishes, new secondary tubules are formed by the elongation and division into two of the external pores (see fig. 10). In general the canals are of very large diameter from their first appearance, and particularly so in the postorbital region. Later, however, their huge size is not apparent, and perhaps this relative shrinkage is responsible for the shift in position of the organs in the main horizontal section of the infraorbital, postotic canals, and elsewhere (see later).

There is no regular alternation of organs with tubules, and no evidence of a schematic correlation of organs and tubules could be found. It seems that organs are not duplicated in the canals, nor are new organs formed once the canals have closed; but it is equally certain that a great many new organs are formed on the surface between the 33 and 50 mm. stages. The same statement does not apply to tubules, there being little or no multiplication of those opening directly into the main canals (except in the mandibular canal) once the 50 mm. stage is reached (figs. 2, 4, 5).

Fig. 10.

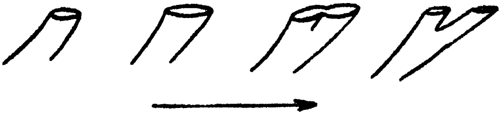


Diagram to show the formation of secondary tubules.

For the most part the canals lie remarkably free from the bones, *i. e.*, in the skin layers above them (the position of the canals being represented by grooves on their outer surface), and probably this phenomenon has facilitated the abnormal development of the lateral line system in this fish. The most striking feature of the canal system is the enormous growth of the infraorbital tubules over the operculum—and in this respect the figures and photographs speak for themselves. The condition is extreme, and the crossing of the preopercular canal is unusual. Allis mentions that in *Alestes* two simple primary tubules cross the preopercular canal; but here the simple nature of the phenomenon stands no comparison with the wonderful elaboration found in the herring.

Another peculiar feature is the fact that the sense organs do not lie in the deepest part of the canals, but rather to one side, and to that side nearest the orbit—an almost universal rule for the herring. As explained previously this condition is undoubtedly secondary—an adaptive feature to meet the relative change of position of entry of the tubule into the main canals (see fig. 7).

The posterior dilatation of the supraorbital canal has already been described, and the presence of the organ calls for explanation. It is possible that this peculiar structure is, in reality, part of the supraorbital canal itself, and the organ, therefore, the last one of the same canal. This would mean that the infraorbital canal anastomoses with the penultimate tubule of the supraorbital and that the last organ becomes enclosed at a later date. This, however, is somewhat doubtful in view of the continuity of the canal and the absence of any surface organ in the appropriate position in the 33 mm. stage. It is more probable that the organ concerned is merely one of the anterior pit-line which has become secondarily enclosed. In the adult this structure occupies the so-called "temporal fossa," which Ridewood describes as being occupied by a "fatty mass." This fossa is characteristic of Clupeoids, and one is tempted to conclude

Fig. 11

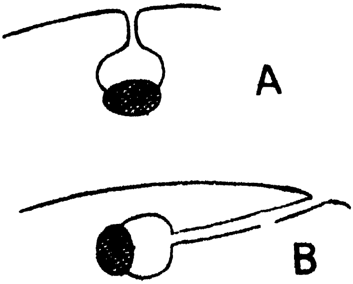


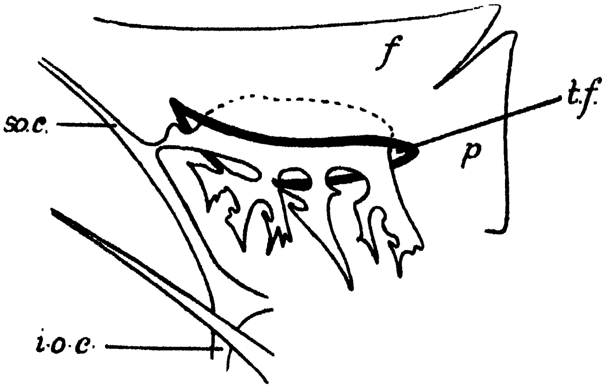
Diagram to illustrate the influence of the point of entry of tubules on

A. Young herring and most Teleosts.
B. Adult herring.

that the posterior dilatation is widespread in the group. In this connection it is interesting to note that Wohlfahrt (1938) describes a similar structure in *C. pilchardus*, differing only slightly from that in *C. harengus*.

The actual function of the dilatation also calls for comment. From its position laying off the main canal it is clear that no appreciable flow of water can pass through it, and, moreover, the deep nature and large size of the vesicle would tend to prevent any through current. From the earlier description we see that it lies as a bag of water, open to the sea and in direct contact with the brain membrane. It will be noticed, further, that the outer surface of the dilatation is perfectly rigid (being shielded by the frontal and parietal), and it follows that the volume of the structure will remain constant except for slight changes brought about by movements of the inner wall (bordering on the "dura mater"). The changes will necessarily be slight on account of the incompressibility of the cerebro-spinal fluid. Nevertheless slight changes of pressure about the head region might cause sufficient movements of the inner wall of the dilatation to cause the volume to fluctuate, and therefore cause an ebb and flow of current through the dilatational pores. This, in turn, would affect the organ which lies

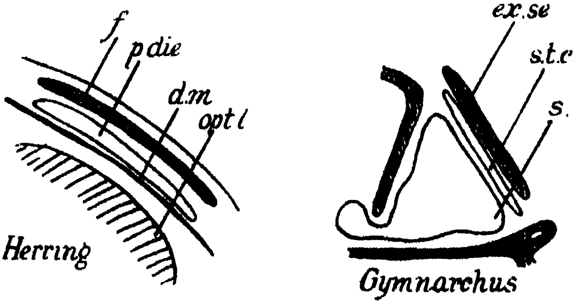
Fig. 12.



Lateral view of part of a vinylite cast, showing the posterior dilatation "housed" in the temporal fossa.

in relation to the posterior pore (fig. 3). In this way the dilatation might well act as a sense organ recording the differences of pressure about the head, caused by the movements of a herring at speed. The deep nature of this structure, underlying the frontal and parietal, recalls the case of *Gymnarchus* with its acustico-temporal pit. Here the supratemporal canal lies beneath the extra-scapular, and comes into contact with an extension of the sacculus of the ear (fig. 13). This structure is, I think, too crude for the detection of sound waves (as Allis maintains), but here again differences of pressure would be recorded by the sacculus, and thence *via* the otic nerve to the brain. It is clear, then, that these two structures, one in herring the other in *Gymnarchus*, may now be adapted to the detection of differences of pressure no matter what the actual function of the lateral line itself.

Fig. 13



Explanation as in text.

Another interesting feature is the great variation found in the canal systems of different herrings, and even in the two sides of the same individual (see the photographs on this point).

Pit-lines, etc.—The number of surface organs increases gradually from the 33 mm. condition, and although the 50 mm. stage already shows the final grouping, the adult shows them intensified with a greater number of organs.

The transverse row of organs stretching across the head anterior to the occipital commissure is clearly the middle pit-line, and is associated, as expected, with the parietal. Immediately anterior to this there is another parallel row of four organs (50 mm.) whose presence in this region is puzzling, unless they are part of the anterior pit-line with the dilatational organ as another member of the same series secondarily enclosed. On the top of the head, and lying between the orbits, there is a longitudinal series of organs associated with the frontal. The exact interpretation of these is a matter of considerable difficulty, and the only conclusive method of investigation—the nerve innervation—could not be used in this case.

In the snout region there is a huge development of organs below and anterior to the nostrils, and stretching as a band across the fish from one side to the other. This may be, in part at least, an indication of the anterior cross commissure found in other Teleosts. The rest of the surface organs lie scattered in three general groups. Those immediately below the infraorbital canal lie in the same relative position as those of *Esox americanus*, and in the latter fish Allis considers them to be homologous with the horizontal cheek-line of *Amia*. Consequently these organs are probably homologous with those of both *Esox* and *Amia*. The second group is situated around the angle of the jaw, chiefly in association with the lower jaw, and therefore probably represents the oral pit-line. Lastly, there are scattered organs over the operculum the exact significance of which is open to question.

Cranial Bones.—The skulls of adult herrings examined by me showed only slight variations from those shown by Ridewood for *Clupea finta*. In the orbital series the most posterior dorsal member is either absent in *C. finta* or else Ridewood failed to record it. This bone, included in the orbital series in this paper, would be identified by Allis as the dermal postfrontal, especially in view of the related sense organ. Passing forwards, it is probable that the lacrymal is either contained in or homologous with the most anterior of the infraorbital series. The jaw and opercular bones are typical, and call for no comment beyond pointing out how perfectly they match the corresponding bones of *Leptolepis* (especially the crescent-shaped premaxilla of the 50 mm. stage and the anterior and posterior supramaxillaries) and that the angular is present in all Clupeoids although absent in many Teleosts.

The squamosal (the pterotic of some authors) is represented at the 50 mm. stage by a long peculiar shaped bone, having an anterior swollen portion touching the orbit. In the adult specimens there is no such anterior prolongation of the squamosal; but there is no doubt of the continuity of the bone in the early stage in my specimen, and from its position this portion is identical with the adult postfrontal. In the herring the occipital cross commissure joins the main canal in the supratemporal, and therefore this bone is identical with the lateral extrascapulars of Allis and others (the postparietals of Goodrich etc.). In the distal portion the commissural canal is associated with the parietal; but since there is no organ present in this part no undue significance should be paid to the passage of the canal over the bone, and it is unnecessary to claim fusion of independent bones to explain its presence. In accordance with the rule the preopercular canal joins the main line in the squamosal (Ridewood), which should be called the supratemporal in accordance with the modern agreement of nomenclature (reserving the term squamosal for a more ventral element). Behind the parietal two bones are present—the supraoccipital and epiotic—and both are genuine cartilage bones, the former ossifying on the skull roof and the latter in the otic region. This means that there has been a reduction of dermal bones in the herring, for the elements corresponding to the mesial extrascapulars have completely disappeared unless one allows of a fusion hypothesis—but certainly no foundation for this was seen in the present work.

SUMMARY.

The herring shows the most complicated system of lateral line canals and tubules yet found in the Teleosts.

The position of the organs in the canals is peculiar, and so is the possession of the posterior dilatation lying in contact with the "dura mater." The possible function of this dilatation as a sense organ has been discussed.

Surface organs (unlike canal organs) increase in number from the 33 mm. condition to the adult stage. Anterior, middle, oral pit-lines, a horizontal-cheek line, and the anterior cross commissure were recognized.

In early development the upper jaw elements are strikingly similar to those of *Leptolepis*.

The relation of the canals and organs to the bones, and also the homologies of the latter, are discussed.

List of Abbreviations.

a.c.,	anterior commissure
ang.,	angular.
a.p.l.,	anterior pit-line
art.,	articular.
a.smx.,	anterior supramaxilla
c.,	canal.
cb.,	cerebellum.
c.hy.,	cerato-hyal.
d.,	dentary.
d.m.,	" dura mater "
ep.,	epiotic.
ex.sc.,	extrascapular
f.,	frontal.
h.c.l.,	horizontal cheek-line.
hy.,	hyomandibular.
i.o.c.,	infraorbital canal.
i.op.,	interopercular.
m.c.,	Meckel's cartilage.
md.c.,	mandibular canal.
m.l.l.,	main lateral line.
m.p.l.,	middle pit-line.
mx.,	maxilla
n.,	nasal.
nos.,	nostril.
ob.,	orbital series.
oc.,	occipital cross commissure.
op.,	opercular.
o.p.l.,	oral pit-line.
opt.l.,	optic lobe.
ot.c.,	otic capsule.
p.,	parietal.
p.dil.,	posterior dilatation.
p.f.,	postfrontal.
pmx.,	premaxilla.
p.op.,	preopercular.
p.op.c.,	preopercular canal.
p.ot.c.,	postotic canal.
p.smx.,	posterior supramaxilla.
p.t.,	posttemporal.
p.tu.,	posterior tubule.
q.r.,	quadrate region.
s.,	sacculus.
s.c.,	sensory cells.
sk.,	skin.
s.o.,	sense organ.
s.ob.,	supraorbital.
so.c.,	supraorbital canal.
s.op.,	subopercular.
sq.,	squamosal.
s.t.,	supratemporal.
s.t.c.,	supratemporal canal.
sty.,	stylohyoid.
sup.c.,	supporting cells
t.f.,	temporal fossa

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EXPLANATION OF PLATE IV.

Photographs of adult heads injected with Chinese ink gelatin, to show the variation between different individuals and between the two sides of the same individual.

A. In this specimen the dorsal surface has been pressed to lie on the same level as the operculum.

B. Here the dermal portion of another individual has been removed, and the whole pressed flat.

XXXIV.—Trinucleidæ in *Éire*. By Archie Lamont, M.A., B.Sc., Ph.D., University of Birmingham.

[Plate V.]

From Éire the following species of Trinucleidæ have been described:—

Trinucleus hibernicus Reed, 1895.
Eirelithus thersites (Salter), 1853, gen. nov.
Cryptolithus portlockii (Salter), 1853.
Tretaspis seticornis (Hisinger), 1840.
Tretaspis portrainensis (Reed), 1897.

These fossils, their affinities, and stratigraphical importance are discussed in the present paper, and two of them—*E. thersites* and *T. portrainensis*—are figured for the first time. An account and illustrations are also given of two new forms :--

Tretaspis kjaeri Størmer, 1930, mut. nov. *radialis*.
Tretaspis ceryx, sp. n.

At least *T. ceryx* comes from beds older than those in which other species of *Tretaspis* are known in Britain and Scandinavia. A fragment with *Cryptolithus* sp. and *Tretaspis* sp., the latter misidentified by H. C. Stetson (1927, p. 97). is also discussed.

Records of "*Trinucleus* (?) *concentricus* Eaton" from the Red Limestone (A) at the Chair of Kildare (Reed, 1896, p. 592), and of "*Trinucleus* sp." from a loose block, seemingly with a Llandovery fauna, in the Kilbride Peninsula, County Mayo (Reed, 1912, p. 86), have not yet been re-investigated. Faunas like those of Wicklow (Baily, 1869) and Wexford (Baily, 1879) also await revision.

In preparing the paper Professor O. T. Jones, Professor W. B. R. King, Dr. C. J. Stubblefield, and Mr. A. G. Brighton have helped me with the loan of specimens. To them, and to Professor L. J. Wills for critical reading of the typescript, and to Dr. H. B. Whittington for valuable information on American and other Trinucleids, I am deeply indebted. The Research Committee of Birmingham University made a generous grant towards field expenses.

TRILOBITA.

Family **Trinucleidæ** Emmerich, 1845.

Subfamily *TRINUCLEINÆ* Whittington, 1941.

Genus TRINUCLEUS Murchison, 1839, restricted by Raymond, 1925, and by Whittington, 1941.

Trinucleus hibernicus Reed. (Pl. I. fig. 1.)

1865. *Trinucleus seticornis* W. H. Baily (*pars*) in G. V. Du Noyer, "Explanation to accompany Sheets 167, 168, 178, and 179 of the Maps . . . illustrating Parts of the Counties of Waterford, Wexford, Kilkenny, and Tipperary," Mem. Geol. Surv. Ireland, p. 21, localities 20, 21, 22, *non* 3.
1895. *Trinucleus hibernicus* Reed, "Woodwardian Museum Notes.—1. New Trilobites from the Bala Beds of Co. Waterford," Geol. Mag. vol. xxxii. pp. 52–55, pl. iii. figs. 2–7.
1897. *Trinucleus hibernicus* Reed, "Notes on the Geology of County Waterford.—1. The Fauna of the Ordovician Beds near Tramore," Geol. Mag. vol. xxxiv. p. 511.

1899. *Trinucleus hibernicus* Reed, "The Lower Palæozoic Bedded Rocks of County Waterford," Quart. Journ. Geol. Soc. vol. lv. pp. 732, 737, 744–745 (*pars*), *non* 723.

1912. *Trinucleus hibernicus* Reed, "Notes on the Genus *Trinucleus*.—Part I.," Geol. Mag. vol. xlix. p. 352, pl. xviii. fig. 2; "Ditto.—Part II.," *ibid*. p. 385, pl. xix. figs. 1, 1 *a*.

1927. *Trinucleus hibernicus* H. C. Stetson, "The Distribution and Relationships of the Trinucleidæ," Bull. Mus. Comp. Zool., Harvard, vol. lxviii. no. 2, pp. 88, 96.

Remarks. In the early records this species was ascribed to *Trinucleus seticornis*, but in 1895 Dr. Cowper Reed clearly established it on the abundant material available in the muddy Stage 3 of the Tramore Limestone Series at Newtown Glen, 1½ miles south-south-west of Tramore, County Waterford. It is abundant on the north side of the road, from 150 to 200 yards inland from Newtown Cove Distribution in other areas requires investigation, but it also occurs in calcareous preservation in dark, somewhat baked, muddy beds, with fossils including *Encrinurus fallax* Reed and small brachiopods, on the south margin of Lady Elizabeth's Cove at a point a few feet inland from the top of the diabase sill. Here it appears to be higher than the graptolite horizon in baked sediments at the igneous junction where *Mesograptus foliaceus* (Murchison) and *Nemagraptus gracilis* (Hall) have been obtained (Reed, 1899, p. 730). Presumably this means that *Trinucleus hibernicus* reaches the *N. gracilis* Zone.

In the *Ampyx* Limestone of Norway occurs the closely allied *Trinucleus hibernicus* var. *bröggeri* Størmer (1930, pp. 24–27), which has, however, a glabella less advanced in front of the cheeks, stronger reticulate ornament, and a more pronounced concentric list on the lower lamella. Differences from *T. bucculentus* (Angelin) of the *Ogygia* Shale have been pointed out by Reed (1895, p. 55). We note, going from older to younger, that the *Orthoceras* Limestone, *Didymograptus* Shale, *Ogygia* Shale and the *Ampyx* Limestone, of Norway, are treated by Størmer as covering Llandeilian and Llanvirnian (1934, p. 331).

Dr. Reed recorded *Trinucleus hibernicus* from the Raheen Shales, on the shore of Waterford Harbour, 1⅝ miles south of Passage East (1899, p. 723). These dark and slightly baked shales are taken as occupying a higher horizon than Stage 3 of the Tramore Limestone. While collecting in them the present writer found parts of about a dozen individuals of a form referred in this paper to *Tretaspis ceryx*, sp. n., but no example of the Tramore Limestone species. Re-examination of Dr. Reed's material (SMC* A16,154–63) shows that the better-preserved specimens are definitely referable to the new species.

In addition to his 1895 description, Reed gave further notes (1899, pp. 744–5) on an example from Dunabrattin, in which he calls attention to the great length of the genal spines. He records a spine 16 mm. long in an individual measuring 15·5 mm. from front of the cephalon to the pygidial extremity. The writer has collected a spine 12 mm. long at Newtown Glen. In the Dunabrattin specimen Reed made out six annulations on the axis of the pygidium. This is rather exceptional, four annulations being the rule.

Dr. Reed (*loc. cit.* p. 744) claims all the Trinucleids of the Waterford coast, ascribed by the Irish Geological Survey to *Trinucleus seticornis*, as *T. hibernicus*. As has been remarked above, and as will be shown in the sequel, in at least one notable locality this is not the case.

In the Arenig-Llanvirn of West Shropshire (Whittard, 1931, p. 327 *et seq.*) *Trinucleus murchisoni* Salter (1865, pp. 318–319, pl. xi B. fig. 4 has affinities with *T. hibernicus*.

Subfamily *CRYPTOLITHINÆ* Bancroft, 1933. emend. Whittington, 1941.

EIRELITHUS, gen. nov.

Definition.—The genus *Eirelithus* is proposed for species with pear-shaped carinate glabella, on either side of the base of which triangular depressed areas encroach upon the cheeks. Small eye-tubercles far out on the postero-lateral angles of the cheeks are usually discernible, also faint eye-lines. The lower lamella of the fringe shows a definite girder outside which there are two complete concentric rows of pits. Sometimes parts of a third row appear at the antero-lateral margins as a result of bifurcation of the E_2† row. Other special features are raised E_1 row, and single I row with large pits. Occipital spine probably present.

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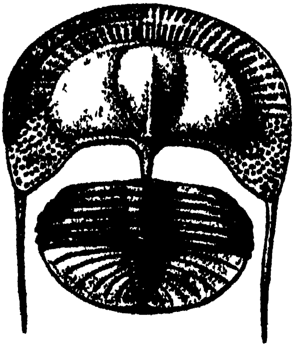
* SMC = Sedgwick Museum, Cambridge.

† This notation may be found in use in Bancroft (1929), Lamont (1935), Whittington (1938, 1940, 1941).

Genotype : *Eirelithus thersites* (Salter).

Discussion. – The genus is allied, but possibly not closely, to *Lloydolithus* Bancroft, 1933, genotype *L. lloydii* (Murchison). "*Cryptolithus lorrainensis*" Ruedemann (Pl. V. fig. 9), reported in 1925 from the Lorraine Formation, New York State, has been referred to *C. bellulus* (Ulrich) by Whittington (1941, pp. 30–34), but there may be affinity with *Lloydolithus*. "*C. lorrainensis*," I presume, includes the specimens figured as "*Trinucleus concentricus*" by Hall (1847, pl. 67, figs. 1 *a–d*). The better illustrations of these depict pygidial pleuræ flexed backwards and arranged very much as in the "unique type of pygidium" upon which Bancroft (1933, p. 3) founded the genus *Lloydolithus*. Traces of alæ seem to persist in the adult in some specimens, a character of *Lloydolithus* rather than of *Cryptolithus*. *L. lloydii* (text-fig. 1), found in the Coed Sion quarries, Llangadock, and also found in the Meadowtown Stage (Llandeilo Series) of West Shropshire, has the same carinate glabella as *Eirelithus*, and well-marked raised alæ which in ontogeny probably develop from triangular areas separate from the cheeks (Størmer, 1930, p. 38; Whittington, 1940) like those in *Eirelithus*. It also resembles the latter in having two

Text-fig. 1.



Lloydolithus lloydii (Murchison), Coed Sion quarries, Llangadock. Fringe removed top left to show external impression of lower lamella with girder inside outer two concentric rows of pits. × 2. (After Salter, 1853.)

continuous rows of pits external to the girder, but there are three or four internal rows anteriorly, as against one in *Eirelithus*. As in *E. thersites*, the glabella of *L. lloydii* does not run forward into the fringe, and in this bio-character both differ from " *C. lorrainensis*."

The triangular depressed areas in *Eirelithus* are especially interesting. Similar areas appear in early life in *Trinucleus*, *Reedolithus*, *Cryptolithus* and *Tretaspis*, but " at later stages they are not well marked from the central portion of the glabella " and " are quite transferred to the lateral lobes of the glabella " (Størmer, 1930, p. 65). This is not the case in *L. lloydii* or in the specimen ascribed to " *C. lorrainensis* " figured in Plate V. fig. 9. These retain distinct alæ and are entitled, therefore, to enjoy separate generic rank. *E. thersites*, we note, keeps the triangular depressions which may be regarded as characteristic of the ancestor of the Trinucleidæ. Speculation is hazardous, but, in England, *L. lloydii* var. *corndensis* (Salter), which first appears in the Betton Stage at the top of the Llanvirn, may be derivative from an ancestor of *E. thersites*, the two evolving in separate provinces, though these may at some juncture have been connected or have been invaded from a common source of fauna (Stubblefield, 1938, p. 413; 1939, pp. 58–9; Lamont, 1939, p. 173).

The genus *Trinucleoides* (Raymond, 1925, p. 19) is not closely allied. Several of Miss Elles's specimens (1940, pl. xxix. figs. 6, 8, 8*a*, ? 9) ascribed to " *Trinucleoides* " *reticulatus* are almost certainly *Lloydolithus lloydii*. They seem to have six segments in the thorax, not seven as claimed (p. 427). Specimen BMNH I.7238 (figs. 7 and 7 *a*) may be allowed to remain as representing the new species, but neither this nor the other individual described as " *T.*" *salteri* (Edgell MS.) are referable to *Trinucleoides*. It has not been proved that in *Trinucleoides* the lateral lobes of the glabella are homologous with alæ—rather the reverse (Whittington, 1940, p. 256); and in any case *T. reussi*, the genotype, has lobes of an oval inflated form (Whittington, 1940, pl. iv., etc.). It also possesses a characteristic *Ampyx*-like glabellar spine and a fringe with only one row of large pits, whatever smaller accessory pits may occur. The figure of " *T.* " *salteri* (Elles, 1940, pl. xxx. fig. 9) illustrates a slab which also carries an external impression of *Lloydolithus* with alæ well developed, but it is probably to the former that Miss Elles's description refers. Her account (p. 428) may be treated as introducing us to a form which calls for further research.

The genus *Reedolithus* Bancroft, 1929, has the same keel-shaped glabella as *Eirelithus* and *Lloydolithus*, but differs from them in preserving its glabellar furrows; it also contrasts with the first in not possessing, in the adult, triangular areas and from the second in not having clearly marked alæ. I rows in *Reedolithus* and *Lloydolithus* correspond in number, whereas in *Eirelithus* there is only one. Typical species of *Reedolithus*, again, have only a single row of pits outside the girder. Admittedly some forms assigned to *Reedolithus*, as noted by Størmer (1930, p. 14), show the girder poorly developed, but in the genotype *R. subradiatus* (Reed) there is a strong girder-ridge inside the external row of pits on the lower lamella (Reed, 1903, pl. ii. fig. 2), and this is even more true of *R. carinatus* (Angelin) as illustrated by Størmer (1930, pl. iv. fig. 13) from the *Ampyx* Limestone. *R. carinatus* has strongly reticulate cheeks and glabella, a development not found in *Eirelithus* and *Lloydolithus*, but also seen in species of *Tretaspis*, such as *T. reticulata* (Ruedemann, 1901), which includes *T. diademata* (Ruedemann, 1901). These have carinate glabella. One of Ruedemann's illustrations (pl. 3, fig. 14) is not very clear, but Dr. Whittington tells me that the specimen has two rows of pits outside the girder, and he compares the fringe with that of *T. kjaeri*, while underlining that the American species is from a much lower horizon, viz. the Black River Group of Virginia and New York (Caradocian).

"*Trinucleus*" *sedgwicki* Salter (1865, pl. 12, fig. 9) and "*T.*" *gibbsii* Salter (1865, pl. 12, fig. 10), from St. David's, Pembrokeshire, are certainly related to *Eirelithus*, *Lloydolithus*, and *Reedolithus*, but they do not have carinate glabella. When they are re-examined, they will probably require to be distinguished generically from their homotaxial equivalents in the Scots-Irish and other faunas.

In apparently having an occipital spine *Eirelithus* resembles *Lloydolithus*, *Reedolithus*, *Cryptolithus*, etc. In *R. subradiatus* the spine reaches back to the fourth thoracic segment (Begg, 1931, pp. 607–8), and in *L. lloydii* even farther (text-fig. 1). "*C. lorrainensis*" certainly has such a spine, if one may judge from what appears to be a broken spine-base on the specimen BU* 293 (Pl. V. fig. 9) and by Hall's illustration (1847, pl. 67, fig. 1 *d*). The significance of such spines is still to be sought. Dr. Whittington points out that they are absent in four genera: *Trinucleus*, *Paratrinucleus*, *Tretaspis*, and *Novaspis*.

Eirelithus thersites (Salter).
(Pl. V. figs. 2-8; text-figs. 2 & 3.)

1853. *Trinucleus thersites* J. W. Salter, "Figures and Descriptions illustrative of British Organic Remains," Mem. Geol. Surv. U.K., Decade vii. pl. vii. p. 7.

1897. *Trinucleus concentricus* Eaton (?). Reed, "Notes on the Geology of County Waterford.—1. The Fauna of the Ordovician Beds near Tramore," Geol. Mag. vol. xxxiv. p. 511.

1899. *Trinucleus concentricus* Eaton (?), F. R. C. Reed, "The Lower Palæozoic Bedded Rocks of County Waterford," Quart. Journ. Geol. Soc. vol. lv. pp. 732, 737, 739.

1914. *Trinucleus thersites*, F. R. C. Reed, "Notes on the Genus *Trinucleus*.—Part II.," Geol. Mag. vol. xlix. p. 394; "Ditto.—Part III.," Geol. Mag. vol. li. p. 358.

1927. *Cryptolithus thersites* H. C. Stetson, "The Distribution and Relationships of the Trinucleidæ," Bull. Mus. Comp. Zool., Harvard, vol. lxviii. no. 2, pp. 88, 95.

Diagnosis.—The outline of the cephalon forms approximately an arc of a circle, but there is a tendency to angulation opposite the antero-lateral parts of the cheeks. The glabella is clavate and carinate, standing high above the cheeks. Anterior lobe reaching to, but not appreciably overhanging, the fringe. No reticulation, but fine punctation, about eight larger punctæ may be distinguishable on cheeks (GSM† 26026; Pl. V. fig. 5). Eye-tubercles towards postero-lateral angles of cheeks. Eye-line (genal cæcum of Ruedemann, 1916 A), rarely seen, approaches posterior margin of cephalon at small angle. Depressed triangular fields occur on either side of the posterior part of the glabella. Narrow alæ may be present on the sides of glabella.

Glabellar furrows indistinct. Pre-glabellar and axial furrows shallow. Sides of glabella rise at right angles from shield.

Cheeks about as long as broad, shaped like quarter-segments of a circle. Definite angle at lateral extremities.

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* BU=Figured Collection, Geological Museum, University of Birmingham.

† GSM=Geological Survey Museum, London.

Antero-lateral margin of cheeks rising sharply from fringe, but no sharp rise posteriorly except from the triangular depressed areas.

The posterior border of the head-shield is in the form of a narrow rim. This bends downwards and back opposite points between the lateral apices of the triangular areas and the lateral ends of the cheeks. The occipital ring, also narrow, lies a little behind the line of the proximal parts of the posterior border. A short occipital spine, rather wide at its base, seems to be present (GSM 26031; Pl. V. fig. 8).

Fringe rather flat, least wide in front of glabella, greater width laterally adding markedly to the transverse nature of the head-shield, reaches back a little behind the rest of the cephalon, ending in outwardly directed spines. Laterally the surface of the upper lamella has the E_1 concentric row of large pits strongly elevated above other concentric rows. Outside E_1 the E_2 row is continuous, and in front of the glabella it has pits of the same size and lying on the same radii as those of E_1. On the antero-lateral margins of the fringe parts of an incomplete E_3 row of pits may appear, about five pits on each side (BU 292; text-fig 2). Inside the raised row E_1, there is a complete concentric I_1 row. Anteriorly the pits in this row are enlarged and reduced in number relatively to the pits in E_1. Inside the I_1 row, the I_2 row shows only 4 or 5 pits on either side, while I_3 has three pits a side. Laterally the I pits lie in definite radial furrows, the ridges between these joining on to the raised E_1 ridge. The lower lamella has a pronounced girder, distal to which are two concentric rows of equal-sized paired pits, radially arranged with the radii flexed forward, so that at the genal angle one of the E_1 pits on each side stands alone (Pl. V. figs. 7–8). Anteriorly to the girder, the surface of the lower lamella, which inside the girder was bent down a little, turns slightly upwards.

Thorax and pygidium unknown.

Dimensions.—

Length of cephalon	2·5–3·5 mm.
Width of cephalon	6·0–11·5 ,, .

Lectosyntypes.—GSM 26026, 26028, 26030, 26031, 26032.

Neosyntypes.—BU Geol. Dept. Museum, Fig. Coll. 290, 291 *a–b*, 292.

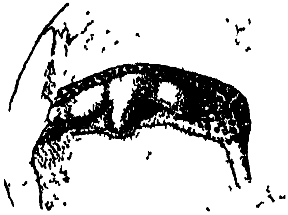
Horizon.—Tramore Limestone Series, Stage 3; just below beds with *Nemagraptus gracilis*, Llandeilo or earliest Caradocian.

Locality—Calcareous muds, roadside section, Newtown Glen, 150 yards inland from Newtown Cove, 1½ miles south-south-west of Tramore

Remarks.—At the type locality this species is not nearly so common as *Trinucleus hibernicus.*

Some primitive characters in *Eirelithus thersites*, and its small size, at first suggest that we are dealing with a Meraspid form Against this stands the fact that though there is considerable variety in the sizes of individuals found, all except one, by no means the largest, show the fringe in the same state of development. It is, therefore, quite likely that in *E thersites* we have an adult or near adult of a genus that retained into mature life the triangular areas, on either side of the base of the glabella, which are found in larval stages of *Trinucleus*, *Reedolithus*, *Cryptolithus*, *Onnia*, and *Tretaspis*. The affinity of *E. thersites* with *Lloydolithus lloydii*, which as an adult has raised ridges running forward along the sides of the glabella from the occipital region, representing a probable development from triangular areas, is suggested by this. The raised alæ remove *L. lloydii* from *Cryptolithus*, the genotype of which, *C. tesselatus* Green, does not in the adult possess such ridges. The eye-tubercles and eye-lines in *E. thersites*, and the presence of specialized features, *e. g.* raised E_1 row in the fringe, occasional

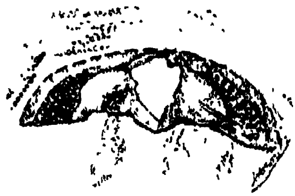
Text-fig 2



Eirelithus thersites (Salter), Newtown Glen, Tramore Plasticine cast of BU 292 showing upper lamella of fringe with radially arranged I pits, raised E_1 row, E_2 row entire, and a few pits of an E_3 row appearing antero-laterally. Note also laterally placed eye-tubercle and depressions at sides of glabella ×3 appearance of E_3 row, enlarged pits of I_1 in front of the glabella (Pl. V. fig. 6), and very strong girder, distinguish *Eirelithus* generically from *Lloydolithus*.

Eye-tubercles are observable in most of the material of *Eirelithus thersites*, and in some specimens clear traces of the eye-lines leading towards the glabella, but not reaching it, are to be seen. Strangely enough, as preserved in one case (BU 291 *a–b*), these eye-lines or genal cæca appear unequal in length. As the eye-spots are generally far out towards the edge of the cheeks, it is likely that the left-hand cæcum in text-fig. 3 is underdeveloped or distorted.

Text-fig. 3.



Eirelithus thersites (Salter), Newton Glen, Tramore. BU 291 *a*. Decorticated specimen showing eye-lines, the left apparently shorter than the right, also radially arranged I pits and raised E_1 row. × 3.

Salter, in giving its specific name to this species which is often preserved with the narrow glabella twisted over to one side, on account of the pressures from the north-west, etc., that have sheared the Tramore rocks, was probably thinking of the lines in which Homer (Iliad, II. 217–19) describes Thersites :

τώ δέ οἱ ὤμω
κυρτώ, ἐπὶ στῆθος συνοχωκότε· αὐτὰρ ὕπερθε
φοξὸς ἔην κεφαλήν . . . *

It is interesting to realize that the species is not deformed, but primitive, though with a few highly specialized features like the raised E_1 row, which point to similar future developments in allied stocks. Thus the tendency to angulation of the antero-lateral margins points to comparison with *Marrolithus favus* (Salter, 1848, p. 350, pl. ix fig. 3), in which, however, it is the internal rows which bifurcate and reunite antero-laterally (Whittington, 1941, p. 24, pl. 6, figs. 19–20). *E. thersites* preserves its eye-lines, but here there is no necessary comparison with *Marrolithus*, since the anterior parts of the lines depicted by Salter (1866, pl. 13, fig. 9) as joining on to the anterior pits * seem to be a mistake, though the lateral extension of Salter's lines towards the posterior angles of the cheeks possibly shows correspondence with the structure figured by Ruedemann (1916 B, pl. 35, fig. 8, etc.). In the occasional appearance of parts of a third row of pits outside the girder, the Irish species manifests a trend like that in *Salterolithus caractaci* (Murchison, 1938, pl. 23, figs. 1 *a*–*f*), which has three or four E rows.

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* "His shoulders were rounded, pulled together on his chest, and above he was peaked in the head."

A raised concentric row of pits on the upper lamella of *Cryptolithus* (?) *chamberlainæ* † (Elles, 1940, pl. xxix, fig. 11), from the Llanvirn, at first suggests comparison with *E. thersites*, but the position of the girder in Miss Elles's species is inside the outer row of pits (pl. xxxi, fig. 10), and there are no alæ. Perhaps comparable with Miss Elles's species is "*Cryptolithus* conf. *portlocki*" (Størmer, 1932, pp. 43–44, pl. 6, fig. 13), from the Upper Chasmops Beds, near Oslo.

Genus CRYPTOLITHUS Green, 1832.

Cryptolithus portlockii (Salter).

1843. *Trinucleus caractaci* J. E. Portlock, "Report on the Geology of the County of Londonderry and of Parts of Tyrone and Fermanagh," pp. 262–263, pl. i. B, figs. 3 *a*–*b*, 4, 5 *a*–*b*.

1843. *Trinucleus elongatus* J. E. Portlock, *ibid.* p. 263, pl. i. B, fig. 7 (also "intermediate variety," fig. 6).

1846. *Trinucleus caractaci* F. McCoy (*pars*), 'A Synopsis of the Silurian Fossils of Ireland,' University Press, Dublin, p. 55.

1846. *Trinucleus elongatus* F. McCoy, *ibid.* p. 55.

1853. *Trinucleus concentricus* var. ε *portlockii* J. W. Salter, "Figures and Descriptions illustrative of British Organic Remains," Mem. Geol. Surv. U.K., Decade vii. pl. vii. p. 6.

1853. *Trinucleus concentricus* var. γ *elongatus* J. W. Salter, *ibid.* p. 6.

1875. ? *Trinucleus concentricus*, W. H. Baily, 'Figures of Characteristic British Fossils: with Descriptive Remarks,' Van Voorst London, p. 39, pl. 13, fig. 6 *b*.

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* Whittington introduces this term in preference to "pseudo-antennary" and the speculative "olfactory." He finds in *Flexicalymene* that they are attachment points of the hypostome.

† Emendation of "*chamberlaini*."

1907. *Trinucleus concentricus* var. *portlockii*, Bernard Smith, in Fearnsides, W. G., Elles, G. L., and Smith, B., "The Lower Palæozoic Rocks of Pomeroy," Proc. R. Irish Acad. vol. xxvi. Sect. B, pp. 121–122, pl. viii. figs. 1–2.
1907. *Trinucleus concentricus* var. *elongatus* Bernard Smith, *ibid.* p. 122, pl. viii. figs. 3–4.
1907 ? *Trinucleus concentricus* var. *arcuatus* Bernard Smith, *ibid.* p. 122, pl. viii. figs. 5–6.
1927. *Cryptolithus elongatus* H. C. Stetson, "The Distribution and Relationships of the Trinucleidæ," Bull. Mus. Comp. Zool., Harvard, vol. lxviii. pp. 89, 95.
1927. *Cryptolithus caractaci* H. C. Stetson (? *pars*), *ibid.* p. 89.
1927. *Cryptolithus portlocki* H. C. Stetson, *ibid.* p. 89.
1935. *Cryptolithus portlockii* A. Lamont, "The Drummuck Group, Girvan: A Stratigraphical Revision, with Descriptions of New Fossils from the Lower Part of the Group," Trans. Geol. Soc. Glasgow, vol. xix. pt. 2, p. 319. (See also B. B. Bancroft, *ibid.* p. 334.)

Remarks.—To this characteristic *Cryptolithus* from the Killey Bridge Beds, Desertcreat, County Tyrone, it has been shown that *C. portlockii* var. *girvanensis* Lamont * is closely allied. The Scots variety is abundant in the Lower Drummuck Group, near Girvan, Scotland, and differs only in the presence of a seventh (I_6) row of pits on the postero-lateral margins of the cheeks (Lamont, 1935, p. 319). *C. portlockii* var. *girvanensis* ranges up to beds close to those which yielded *Dicellograptus anceps* to Mrs. Gray (*op. cit.* p. 291). The Irish form, on the other hand, is reported below beds with *D. complanatus*. The present writer, therefore, concluded that "The Lower Drummuck Beds are possibly slightly younger than at least part of the Killey Bridge Beds." Dr. C. J. Stubblefield has subsequently claimed the Killey Bridge Beds as perhaps belonging to the Caradoc (1939, p. 60). On this view *C. portlockii* was in Irish waters before it migrated to the Girvan area. Numerous other forms appear in Éire sooner than elsewhere, so that Stubblefield's view demands careful investigation. If he is correct, we have further evidence of migration, not of contemporaneity, in the fact that *Tretaspis seticornis* (Hisinger), *sensu stricto*, which appears first in the Killey Bridge Muds, later occurs in the Lower Drummuck and, finally in the *Trinucleus*

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* *Cryptolithus portlockii* var. *girvanensis* includes *Trinucleus* (*Cryptolithus*) *gibbifrons* var. *præterita*, independently described by Dr. Cowper Reed in the third supplement to "The Lower Palæozoic Trilobites of Girvan," and published in December, 1935, two months after my description. *Trinucleus gibbifrons* ? Reed (1914, pl. xxix. fig. 7) is assuredly the same.

Shales of Oslo, which seem to be on a definitely higher horizon than the other two. There are striking points of contact in the brachiopod as well as the trilobite faunas of Killey Bridge and the Lower Drummuck, but, if necessary, we may be ready to recognize the possibility of such a fauna, showing no great change, passing across time divisions (*cf.* Lamont, 1939, p. 173).

Cryptolithus sp. (Text-fig. 7 B.)

The specimen so designated is described on pp. 463–5 along with *Tretaspis* sp.

Subfamily *TRETASPINÆ* Whittington, 1941.

Genus TRETASPIS McCoy, 1849.

Tretaspis seticornis (Hisinger). (Pl. V. fig. 18.)

1840. *Asaphus seticornis* W. Hisinger, 'Lethæa Svecica seu Petrifacta Svecica iconibus et characteribus illustrata,' Holmiæ, p. 3, pl. 37, fig. 2.

1840. *Asaphus cyllarus* W. Hisinger, *ibid.* pl. xxxvii. fig. 3.

1843. *Trinucleus seticornis* J. E. Portlock, "Report on the Geology of the County of Londonderry, and of parts of Tyrone and Fermanagh," Mem. Geol. Surv. Ireland, pp. 262 264, pl. i. B, fig. 8 *a–c*.

1846. *Trinucleus seticornis* F. McCoy (*pars*), 'A Synopsis of the Silurian Fossils of Ireland,' University Press, Dublin, p. 56.

1849. *Tretaspis seticornis* F. McCoy (*pars*), "On the Classification of some British Fossil Crustacea, with Notices of New Forms in the University Collection at Cambridge." Ann. & Mag. Nat. Hist. ser. 2, vol. iv. pp. 410–411.

1854. *Tretaspis seticornis* F. McCoy, in Sedgwick, A., 'A Synopsis of the Classification of the British Palæozoic Rocks and Fossils,' University Press, Cambridge, p. 146 *et seq.*

1907. *Trinucleus seticornis* Bernard Smith, in Fearnsides, W. G., Elles, G. L., and Smith, B., "The Lower Palæozoic Rocks of Pomeroy," Proc. R. Irish Acad. vol. xxvi. Sect. B, pp. 111, 119, 122, pl. viii. figs. 7–8.

1912. *Trinucleus seticornis* F. R. C. Reed, "Notes on the Genus *Trinucleus*.—Part I.," Geol. Mag. vol. xlix. p. 348 *et seq.* pl. xviii. fig. 5.

1914. *Trinucleus seticornis* F. R. C. Reed, "Notes on the Genus *Trinucleus*.—Part III." Geol. Mag. vol. li. p. 353 *et seq.*, ? pl. xxviii. figs. 5, 5 *a*.

1927. *Tretaspis seticornis* H. C. Stetson (*pars*). "The Distribution and Relationships of the Trinucleidæ," Bull. Mus. Comp. Zool., Harvard, vol. lxviii. p. 89.

1935. *Tretaspis seticornis* var. A. Lamont, "The Drummuck Group, Girvan: A Stratigraphical Revision, with Descriptions of New Fossils from the Lower Part of the Group," Trans. Geol. Soc. Glasgow, vol. xix. pt. 2, p. 299.

For references to extra-Irish occurrences, in addition to those discussed by Cowper Reed, Stetson, and Lamont, see Leif Størmer (1930, p. 55).

Remarks.—This little species has been clearly figured by Bernard Smith (1907) from the Killey Bridge Beds. It also occurs in the Lower Drummuck, where it occupies an horizon below that of *Tretaspis cerioides* var. *sortita* Reed, the latter being rather like *T.* cf. *kjaeri* as identified by Dr. H. B. Whittington (1938, p. 445, pl. xxxviii. figs. 1–3), and characteristic of the Upper Drummuck Beds. Only fragments of *T. seticornis* were available in 1935, when the writer published a revision of the Drummuck Group, but the discovery of the specimen HM* A602 (Pl. V. fig. 18) appears to show identity of the Girvan fossil with that from the Killey Bridge Beds on the one hand and with that from the *Trinucleus* Shale (Størmer, 1930, pp. 55–58) of Norway and Sweden on the other. In Størmer's scheme the zoning of the Scandinavian Ashgillian is as follows :—

Zone with *Tretaspis latilimbus,*
,, ,, ,, *granulata* + var.
,, ,, ,, *seticornis,*
,, ,, ,, *kjaeri,*
,, ,, ,, *cerioides* + var.

Whether we accept Dr. Stubblefield's revolutionary views on the dating of the Killey Bridge Beds or not, it will be seen that *T. seticornis* appears relatively earlier in Éire and Scotland than in Scandinavia.

An apparently authentic *Tretaspis seticornis* (His.) is figured by Dr. Cowper Reed (1912, pl. xviii. fig. 5) from Applethwaite Common (Coniston Limestone Series). In Professor W. B. R. King's collection *T. seticornis* occurs from Rawthey Bridge (*Phacops robertsi* Beds). This has the characteristically narrowed concentric rows of pits in front of glabella and cheeks, and only six pits on each side on the posterior margin of the fringe. It, or a mutation, also occurs in the Sally Beck section (*Calymene* Beds).

Dr. Reed refers a Shoalshook Limestone *Tretaspis* to *T. seticornis*. Two of his figures (1914, pl. xxviii. figs. 5, 5 *a*) are not diagnostic, whilst his earlier diagrams (1912, pl. xix. figs. 5, 5 *a*) have too many complete concentric rows of pits (5–6) on the cheek-roll to agree with *T. seticornis*. These, as was realized by Reed (1912, p. 392), closely resemble the Girvan, Upper Drummuck Group, form now referred to *T. cerioides* var. *sortita* Reed (1935). This conclusion is supported by a pair of specimens from ochreous weathering Shoalshook Limestone, referable to *T. cerioides* var. *sortita*, which were lent to the writer by Professor King and are probably to be regarded as a mutation rather than a local race or variety.

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* HM = Hunterian Museum, University of Glasgow.

Differences between *Tretaspis seticornis* and *T. cerioides* (Angelin), which is probably identical* with *T. clarkei* Cooper, from Percé, Quebec, have been given by Dr. G. Arthur Cooper (1930, p. 370). After examining several specimens presented to the Birmingham University Geological Museum by Dr. Cooper, the writer finds that, as may be seen from Cooper's figures (1930, pl. 4, fig. 7, etc.), one constantly recurring difference is the restriction in *T. seticornis* of the second concentric row of pits anterior to glabella and cheeks to two or three pits in front of each axial furrow and the extreme narrowness of the third row, which is raised on a concentric ridge but does not consist of large pits as in *T. cerioides*. The outer rows in both species are similar. The minor nature of the differences emphasizes the relationship of the Percé, Quebec, fauna with that of the Lower Ashgillian in Western Europe (*cf.* Lamont, 1935, p. 304; 1939, p. 175). Upper Ashgillian faunas on the two sides of the Atlantic Ocean seem less closely akin, as Dr. Curt Teichert has remarked in regard to Cephalopoda (1939, p. 113).

Tretaspis portrainensis (Reed). (Pl. V. figs. 15–16.)

1897. *Trinucleus seticornis* var. *portrainensis* F. R. C. Reed, in Gardiner, C. I., and Reynolds, S. H., "An Account of the Portraine Inlier (Co. Dublin)," Quart. Journ. Geol. Soc. vol. liii. pp. 524, 538–539.

1927. *Tretaspis portrainensis* H. C. Stetson, "The Distribution and Relationships of the Trinucleidæ," Bull. Mus. Comp. Zool., Harvard, vol. lxviii. p. 89.

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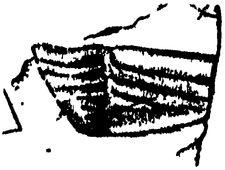
* In *T. cerioides*, when three concentric rows of pits occur in front of the glabella, the two inner rows fuse together laterally (Størmer, 1930, p. 46). This is not the case in one Percé specimen of "*T. clarkei*" examined by the writer, where the two inner rows on the cheek roll are continuous laterally, while the outer row fails. Other three specimens of "*T. clarkei*," in the Birmingham University Collection, show, however, a like condition with that defined by Størmer in *T. cerioides*, and seem to justify in practice the equalization of the two species by Whittington (1941, p. 29).

Specimens of parts of a cephalon (BU 294), of a fringe (BU 295), and of a pygidium (BU 296) collected by the writer have been used to amplify Dr. Cowper Reed's description.

Diagnosis.—The outline of the cephalon semicircular in front, but with fringe continuing back for some distance behind the rest of the head-shield. Cheeks, as long as wide, do not overhang the fringe, but laterally project into it. Glabella strongly arched, standing well above the cheeks, from which it is separated by deep axial furrows. Posteriorly the glabella is cylindrical and very narrow, expanding suddenly at about one-third of its length and still becoming wider almost until the anterior margin of the pseudofrontal lobe is reached. The latter overhangs the fringe but does not encroach upon it. Eye-spots have not been observed.

Text-fig. 4.



Tretaspis portrainensis (Reed), Trilobite Shales, Tower Bay, Portrane. BU 296. Internal cast of pygidium, showing pairs of appendifer pits on right side of rachis and three very well defined pleuræ. ×3.

The cheek roll of the fringe is only gently bent down. and distally the dorsal lamella is seen to flatten out where three complete concentric rows of pits are disposed in marked radial sulci. In front of the anterior margin of the cheeks there are four concentric rows of pits, without clear radial arrangement and without intercalated small pits. Traces of a list or concentric ridge, not rising so high, however, as the radial partitions, are seen outside the innermost row of pits. The flattened out lateral parts of the fringe show a very large number of pits, as many as seventeen occurring along the posterior margin on each side.

Pygidium with semi-elliptical outline. Rachis divided into seven segments. Appendifers marked in internal cast. First three pleuræ also very clearly defined (text-fig. 4). Doublure nearly 1 mm. deep at right angles to plane of pygidium.

Dimensions.—

Width of cephalon	20	mm.
Length of glabella	6·5	,,
Length of posterior margin of fringe..	10	,,
Length of pygidium.............	3·1	,,

Paratypes.—The three specimens (BU 294, 295, 296) are selected as paratypes with that described by Dr. Reed.

Locality.—Trilobite Shales, Tower Bay, Portrane, County Dublin.

Horizon.—Probably late Caradocian or early Ashgillian.

Remarks.—This form, allied to *Tretaspis granulata* Wahlenberg, is provisionally advanced to specific rank. It is found along with other trilobites that suggested a Middle rather than Upper Bala age to Dr. Reed (1897, p. 538). The beds in which it occurs probably have faulted boundaries. They may be roughly contemporaneous with the Portrane Limestone, since, like the latter, they seem to show signs of disturbance which in their case involves submarine intrusion of one colour of clay into another.

The *Tretaspis* fragments found in the Limestone are assigned below to *T. kjaeri* mut. nov. *radialis*. They have a lesser number and more regular arrangement of pits in certain parts of the fringe than *T. portrainensis*.

A comparable form, *Tretaspis* cf. *granulata*, occurs in the Lower Ashgillian Beds at Crugan Lane, Pwllheli (Lamont in Matley, 1938, p. 593). A specimen of this is figured in Pl. V. fig. 17. Its glabella is similar to that of the Irish form, but has a less swollen pseudofrontal lobe; the cheeks, too, are narrower, and overhang the fringe a little. The fringe of the Pwllheli form descends more steeply and is more concave than that of *T. portrainensis*. Both have three rows of pits in radial sulci on the margin of the upper lamella and four rows inside on the roll in front of the anterior margin of the cheeks. The latter four rows show clear radial arrangement in *T.* cf. *granulata*, but with extra pits intercalated in the innermost row—a phenomenon not seen in *T. portrainensis*.

Dr. Reed remarked on the spread-out or "flattened-out" (1897, p. 538) nature of the posterior angles of the fringe. The angles of the fringe are evidently not so greatly bent down and not produced backwards so far as those in *T.* cf. *granulata*. Reed's observation is thus partly correct, but, when he treats the genal angles of the fringe as "not produced backward behind the head," one cannot quite agree with him (see Pl. V. figs. 15–16)

Tretaspis cerioides var. *sortita* Reed, 1935 (=*T. bucklandi* of Reed's earlier work), from the Upper Drummuck Group, Girvan, has been treated as identical with *T. granulata* Wahlenberg by Størmer (1930, p. 69) The Girvan species seems to differ from *T. cerioides* in having a smooth glabella and cheeks, and from *T granulata* in possessing eye-tubercles.

Whether varietal or mutational, the differences between *Tretaspis portrainensis* and *T.* cf. *granulata*, such as the occurrence in the former of higher glabella, wider cheeks, fringe less sharply bent down and with a larger number of pits on its posterior margin, do not allow us to equate the two. A Lower Ashgillian age is certainly indicated for the Crugan Lane species, which has associates recalling the Whitehouse fauna of Girvan, as well as certain Bohemian and Percé, Quebec, elements. The Irish specimen may be of the same age, or it may be a case of the gens of *Tretaspis granulata* putting in an earlier appearance in Éire than elsewhere.

The pygidium is not unlike that of *Tretaspis kjaeri* Størmer (1930, pl. 10, fig. 2), but the second and third pleuræ, as well as the first, are clearly distinguished.

Tretaspis kjaeri mut. nov. *radialis*.

(Text-figs. 5 & 6.)

1897. *Trinucleus seticornis* F. R. C. Reed, in Gardiner, C. I., and Reynolds, S. H., "An Account of the Portraine Inlier (Co. Dublin)," Quart. Journ. Geol. Soc. vol. liii. p. 536.

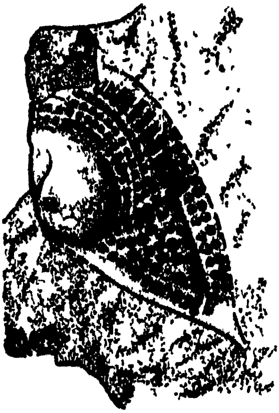
1897. *Trinucleus seticornis* var., *ibid.*

This mutation is founded upon two fairly distinctive fragments from the Portrane Limestone preserved in the

Sedgwick Museum, A16202 (text-fig. 5) and A16203 (text-fig. 6).

Diagnosis.—Cheek longer than wide, fairly smooth or possibly slightly reticulate, small eye-tubercle situated at two-thirds distance from front of cheek and rather close to glabella. Upper lamella of fringe with strongly marked radial arrangement of pits. Fringe not sharply bent down. Cheeks do not overhang on fringe. Cheek-roll only slightly convex, with four concentric rows of pits in front of cheek, the inner pair uniting laterally. Concentric partitions between rows of pits not rising higher than radial partitions. Distal flattened part of fringe with three concentric rows of pits arranged in radial sulci. Posterior margin with about twelve pits. Lower lamella with anterior pits in radial sulci, except for three outer rows. Strong obtuse girder inside outer pair of rows,

Text-fig. 5



Tretaspis kjaeri mut. nov. *radialis*, Portrane Limestone, Portrane. SMC A16202, showing upper lamella at top of figure and external impression of lower lamella postero-laterally. Girder inside E_1 and E_2 rows, with extra pit intercalated in latter towards genal angle. × 2.

with secondary concentric ridge behind third concentric row. Strong genal spine outwardly directed

Glabella, thorax, pygidium unknown

Dimensions.

Width of cheek	5.5 mm
Length of cheek	7 5 ,,
Length of posterior margin of cheek and fringe	11·0 ,,

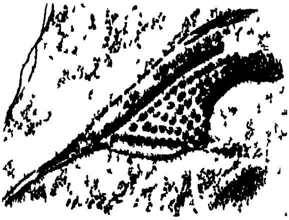
Syntypes -SMC A 16202 and A 16203.

Horizon —High Caradocian or Lower Ashgillian

Locality Portrane Limestone, possibly from landward end of promontory, a quarter of a mile south-west of North Martello Tower, Portrane, County Dublin or from locality in Asylum grounds, now built over

Remarks —This Trinucleid is clearly distinguished from *Tretaspis portrainensis* by the great regularity of the radial arrangement of the pits opposite the anterior margins of the cheeks, and by having only about twelve pits along the posterior margin of the fringe. It compares with *T. cerioides* (Angelin) and *T. kjaeri* Størmer (1930) in having two concentric rows of pits immediately in front of the cheeks, which unite laterally, but differs from them in having only 3 or 4 concentric rows on the cheek roll instead of 4 or 5. The cheek-roll is also much less steep in the Portrane mutation, and lists are not prominently developed.

Text-fig. 6.



Tretaspis kjaeri mut. nov *radialis*, Portraine Limestone, Portrane. SMC A16203, external impression of lower lamella, showing that pits in front of cheek were arranged in radial furrows ×2

At Sally Beck (*Calymene* Beds, in the North of England), the dominant species is one allied to *T*. cf. *kjaeri* as identified by Whittington (1938, p. 445, pl. xxxviii. figs. 1–3). From external impressions, collected by Professor King, it is seen to have smooth cheeks and glabella, and no reticulate ornament as in *T*. *kjaeri* Størmer. Whittington's specimens from Llansantffraid, Montgomeryshire, are also probably smooth-shelled. One of these (no. 433, BU 210) has the pseudofrontal lobe of the glabella invading the cheek-roll, but this is not the case in Professor King's examples, or in Whittington's nos. 431 and 432, which are very close to the *Calymene* Beds forms except that most of the latter have less prolongation backward of the limb of the fringe. In this latter character those from the *Calymene* Beds resemble *T*. *kjaeri* mut. nov. *radialis* from the Portrane Limestone.

Tretaspis kjaeri mut. nov. *radialis* corresponds with *T*. *kjaeri* and the specimens described as *T*. cf. *kjaeri* by Whittington in the crowding of the pits in the outermost row towards the lateral angle. It also exactly corresponds with Whittington's form in number and arrangement of pits on the cheek-roll. The lateral eye-tubercles are in the same position in all three instances, but *T*. *kjaeri* mut. nov. *radialis* has a flatter fringe than the others, more in the plane of the rest of the cephalon. In this, as in other respects, *T*. cf. *kjaeri* may provide a link between *T*. *kjaeri* mut. nov. *radialis* and the original Scandinavian *T*. *kjaeri*. All are possibly mutations within the same gens.

Tretaspis ceryx *, sp. n. (Pl. V. figs. 10–14.)

1899. *Trinucleus hibernicus* F. R. C. Reed (*pars*), "The Lower Palæozoic Bedded Rocks of County Waterford," Quart. Journ. Geol. Soc. vol. lv. p. 723.

1939. *Tretaspis* cf. *cerioides* A. Lamont in Stubblefield, C. J., "Some Aspects of the Distribution and Migration of Trilobites in the British Lower Palæozoic Faunas," Geol. Mag. vol. lxxvi. p. 59.

1939. *Tretaspis* cf. *cerioides* A. Lamont, "Notes on Distribution and Migration of Brachiopoda in the British and Irish Lower Palæozoic Faunas," Irish Nat. Journ. vol. vii. p. 173.

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* κήρυξ = a herald.

Diagnosis.—Semi-circular cephalon. Genal spines rounded on ventral side, carrying longitudinal groove dorsally, sub-parallel or slightly convergent, extending backwards at least as far as extremity of pygidium. Glabella strongly arched and reticulate, pseudofrontal lobe hemispherical, with smooth ocular tubercle high above cheeks, overhanging the fringe a little in front. First lateral glabellar furrows scarcely seen on sides of pseudofrontal lobe; second glabellar furrows deep oval depressions, like eye-holes in a skull, directed backwards as they approach the axis; third glabellar furrows smaller, less deep, running obliquely forwards to axis at as small an angle as 45°. Lateral lobes smooth, those between second and third pairs of furrows swollen laterally, but deeply depressed in the triangular hollows that encroach upon the posterior part of the glabella.

Anterior pits at anterior ends of axial furrows that widen posteriorly and are smooth in contrast with the reticulate cheeks. Inner margins of cheeks lying nearly at right angles to posterior margin of cephalon. Postero-lateral angles of cheeks rounded. Cheeks themselves a little longer than wide. Behind a line joining the anterior pit to the postero-lateral angle cheeks tend to be bent downwards. Otherwise they are well inflated. Anterior margins overhanging fringe. Smooth ocular tubercle on each cheek distinctly raised, sometimes with trace of eye-ridge running obliquely forward (Pl. V. fig. 12).

Posterior border of cephalon a narrow elevated rim. Occipital ring narrow, but rising steeply well above the posterior margin. A marked pair of semi-oval pits, corresponding with occipital furrow, lie in front of each end of the ring.

Fringe of fairly even width, bent down in front and at sides, concave upwards near brim, reaches back behind rest of cephalon a distance rather less than the length of the cheek, and is continued in spines. Upper and lower lamellæ show marked radial arrangement of pits, except near the middle of the posterior margin, where about five pits are not clearly referable to any of the radial or concentric rows. In front of glabella and anterior part of cheeks, the cheek-roll has three concentric rows of pits and three concentric lists (raised ridges). Beyond the outer list are radial sulci, each with three pits. Laterally the two inner rows on the cheek-roll converge, uniting to give an innermost row of large pits round the lateral margins of the cheeks. Thus only two lists run backwards on to the lateral parts of the fringe, and these cease to be in evidence on reaching the "disarranged" pit-complex. Laterally, also, the radial sulci only contain two rows of pits, and the third concentric row is separated as a row of large pits. The last two pits at the genal extremity are not in a sulcus. The glabella encroaches a little, and causes a displacement forward of pits in the anterior part of the upper lamella, a feature also seen in the lower lamella.

Strong girder, with two concentric rows of pits outside it, marks position of right-angled bend in lower lamella. All pits outside girder paired in sulci, except for single pit on each side at base of spine. Pits inside girder also radially disposed in sulci, save for about five large ones situated posteriorly.

Thorax of six segments. Rachis about one-quarter total width, well arched, fourth axial ring with small median pit. Articulating rings with deep paired depressions. Axial furrows shallow. Small pits at proximal ends of narrow anterior pleural bands. Posterior pleural bands each with slightly oblique ridge, strong on surface but weak in decorticated specimens. Lateral parts of pleuræ, beyond gentle fulcrum, not large.

Pygidium with raised rim, reached by slightly tapering rachis of six or seven segments. Posterior band turned down at right angles. Five pleuræ can be made out, on the first of which there is a definite oblique ridge continuous with the axial ring. Pleural furrows faint or not seen. In decorticated pygidia only ridges on anterior pair of pleuræ are distinguishable.

Dimensions.—

Length of BU 297 *a* (front of fringe to tip of pygidium)	14 mm.
Greatest width	15 „
Length of cephalon	7 „

Length of thorax	4 mm.
Length of pygidium	3 ..
Greatest width of pygidium	9·5 ,.

Syntypes.— BU 297, 298, 299.

Horizon.-- Caradocian.

Locality. -Raheen Shales, shore, south of Raheen Stream, 1⅝ miles south of Passage East, County Waterford.

Remarks This species appears at a surprisingly early date when compared with its closest ally, *Tretaspis cerioides* (Angelin), from the Upper Chasmops Limestone (topmost beds) in southern Norway, assigned by Størmer (1934, p. 331) to the very top of the Caradocian, but which contains the typically Lower Ashgillian *Stygina latifrons* (Portlock) found in the Killey Bridge Beds of County Tyrone and in the Lower Drummuck of Girvan. Its occurrence in the Raheen Shales puts *Tretaspis* definitely among those genera that reached Éire sooner than anywhere else in Europe (*cf.* Stubblefield, 1939, pp. 56–57; and Lamont, 1939, p 173), but it also appears about the same time in the Black River Formation of North America. H. C. Stetson writes (1927, p. 98): -" Bohemia has usually been considered the centre of origin and distribution of this family (the Trinucleidæ), but it soon becomes apparent that Great Britain is the more important source, which position it holds throughout the Ordovician." Stetson's conclusion, if we substitute Éire, or a more westerly source, instead of Great Britain, is substantially correct.

The Raheen Shales are probably a good deal later than the Tramore Limestone Series, at the top of which *Nemagraptus gracilis* has been recorded (*vide supra*, p. 440). Portlock (1843), followed lately by Professor W. F. Whittard (1940), ascribed their fauna to the Llandeilo, but in this paper, on the ground of their post-*N. gracilis* date, they are put in the Caradocian. The fauna has difficult affinities, some species appearing sooner and some later than they do elsewhere, probably as a result of invasions from an area where the Scots-Irish fauna was undergoing progressive mutation. As an example of this a common Raphiophorid of the *Bifidus* Zone (Llanvirn) in

West Shropshire has been identified by Whittard as *Ampyx mammillatus* var. *austinii* (Portlock) of the Raheen Shales, though the proportions of certain glabellar features may not quite correspond

Tretaspis ceryx has the same three lists on the upper lamella as *T. cerioides*, the inner one extending only in front of the glabella and the anterior parts of cheeks. These lists are not so strong as in mature *T. cerioides*, and the outer pair certainly do not continue in such definite fashion towards the gonal angles. There, moreover, *T ceryx* possesses a much greater number of pits than *T. cerioides*, and the limbs of the fringe extend back a good deal further behind the rest of the cephalon. In this *T. ceryx* approaches more nearly to *T. kjaeri*, but does not have so many pits along the posterior margins on each side of the fringe, or so many concentric rows on the cheek-roll.

Another distinguishing character of *Tretaspis ceryx* is that faint, but undoubted, eye-lines are seen (Pl V. fig. 12). These have not been reported in either *T cerioides* or *T. kjaeri*, but are sometimes observable in *T seticornis*

The pygidium of the Raheen species has a greater number of segments (6–7) than appear in that ascribed to *T. cerioides* by Størmer (1932, pl. 9, fig. 4), and in this regard it shows a nearer resemblance to the pygidium of *T kjaeri* (*ibid.* pl. 10, fig. 2). At the same time the internal casts of pygidia of *T. kjaeri* have more marked pleural characters than ours In the latter also the segmentation is not seen continuing on to the downturned margin, as in the Norwegian species (*ibid.* pl. 10, fig. 4).

Though possessing more segments, the pygidium of *T. seticornis* also resembles that in the new Irish species.

There are ten specimens of *Tretaspis ceryx* in the Sedgwick Museum, Cambridge (SMC A 16154 16163).

Tretaspis sp. (Text-fig. 7 A.)

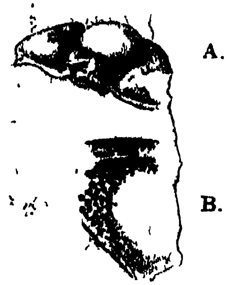
1899. ? *Trinucleus hibernicus* F. R. C. Reed (*pars*), "The Lower Palæozoic Bedded Rocks of County Waterford," Quart. Journ. Geol. Soc. vol. lv. p. 723.

1927. *Trinucleus hibernicus* H. C. Stetson (*pars*), "The Distribution and Relationships of the Trinucleidæ," Bull. Mus. Comp. Zool., Harvard, vol. lxviii. p. 97.

Remarks.—The small slab of grey micaceous silty shale. part of which is illustrated in text-fig. 7 (SMC A16152 and 16153), is recorded as from the Raheen Shales, Newtown Head, Waterford. The specimen, however, is fresher than the rusty-weathering material at the typical locality south of the Raheen stream-mouth, 1¾ miles south of Passage East, so that possibly this slab is from a different position.

Specimen A, consisting of glabella and cheek, with prominent eye-line, lies close to another (B) with cheek and fringe-characters reminiscent of "*Cryptolithus*" *gibbosus* Elles (1940, pp 425 427, pl. xxxi, figs. 3 9), from the Llanvirn, and of *C. portlockii*, from the Lower Ashgillian. Specimen A has apparently been ascribed by Dr. Reed to *Trinucleus hibernicus*, and as such was accepted by Dr. H. C. Stetson (1927, p. 97). It differs from the usual *T. hibernicus* in possessing a marked eye-line, and the lobes between the glabellar furrows are stronger. In spite of the approach of this glabella to the character of that in certain species of *Trinucleus*, which fall within a group referred tentatively to *Botrioides* by Stetson (1927, p. 97), the fragment seems to belong either to *Tretaspis seticornis* or to *T. ceryx*, sp. n. There is no likelihood, since the cheek is more

Text-fig. 7.



A. *Tretaspis* sp. Locality doubtful. SMC A16152, decorticated glabella and cheeks. Note eye-line. B. *Cryptolithus* sp. SMC A16153. Part of upper lamella of fringe; decorticated cheek. ×2 convex and more angular laterally, that it belongs to the *Cryptolithus* fringe (B), which may well represent part of an individual of *C. portlockii*.

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EXPLANATION OF PLATE V.

Fig. 1. BU 289. *Trinucleus hibernicus* Reed. Internal cast of cephalon, showing upper lamella of fringe. Tramore Limestone, Stage 3, Newton Glen, 1¼ miles south-south-west of Tramore, County Waterford. ×2.

Fig. 2. GSM 26030. *Eirelithus thersites* (Salter), gen. nov. Plasticine cast of lectosyntype. Note depressed areas on either side of base of glabella, and E_1 row of pits rising on a concentric ridge laterally on the upper lamella. Tramore Limestone, Stage 3, Newtown Glen as above. ×4½.

Fig 3 GSM 26028. Ditto. Lectosyntype. Internal cast of cephalon, showing carinate glabella, depressed area, eye-spot far out towards posterior lateral angle of left cheek, and lateral bending back of posterior margin. Same horizon and locality. ×4½.

Fig. 4. GSM 26030. Ditto. Lectosyntype. External cast of cephalon. Same horizon and locality. ×4½.

Fig. 5 GSM 26026. Ditto. Plasticine cast of lectosyntype. Cheek with about eight fine punctations, raised E_1 row on upper lamella, and genal spine. Same horizon and locality. ×4½.

Fig. 6. GSM 26032. Ditto. Plasticine cast of Lectosyntype. Anterior of glabella not encroaching on fringe, which shows continuous E_2, E_1, and I_1 rows, the last consisting of larger pits. Same horizon and locality. ×4½.

Fig. 7. BU 290. Ditto. Part of upper lamella with one more pit in E_2 than in E_1 laterally. Same horizon and locality. ×4½.

Fig. 8. GSM 26031. Ditto. Internal cast of cephalon, showing also external cast of lower lamella of fringe. Note strong concentric girder inside E_1 row of pits; also occipital spine. Same horizon and locality. ×4½.

Fig. 9. BU 293. ?"*Cryptolithus lorrainensis*" Ruedemann. Internal cast of cephalon and thorax; also external cast of lower lamella of fringe. Carinate glabella, with left ala on its side, clearly seen. In front fringe is broken at girder: laterally, however, E_1 and E_2 rows occur, the outer one not clear in photo. Lorraine formation, Rome, New York. ×3.

Fig. 10. BU 297 *a*. *Tretaspis ceryx*, sp. n. Syntype. Complete specimen, internal cast except fringe, which appears as external cast of lower lamella. Raheen Shales, shore below high-water mark, 1¾ miles south of Passage East, County Waterford. ×2.

Fig. 11. BU 298. Ditto. Syntype. External cast of cheek with reticulate ornament and of upper lamella, showing insertion of extra row of pits (I_2) in front of anterior part of cheek. Same horizon and locality. ×2.

Fig. 12. BU 298. Ditto. Plasticine cast of syntype. Note eye-line. Upper lamella with concentric lists, not so high or continuing so far posteriorly as in *T. cerioides*. Three concentric rows of pits in radial sulci in anterior part of fringe. ×3.

Fig. 13. GSM 14021. Ditto. Plasticine cast. Fringe with lists, glabella and cheeks reticulate; long genal spines. ? Same horizon and locality. ×3.

Fig. 14. BU 299 *a*. Ditto. Syntype. Internal cast, showing eye-spots on cheeks and glabella, and posterior lateral margins of shield bent downwards and backwards. ×3.

Fig. 15. BU 294. *Tretaspis portranensis* (Reed). Paratype. Internal cast of cephalon, showing upper lamella of fringe. Trilobite Shales, south of Slipway, Tower Bay, Portrane. ×2.

Fig. 16. BU 295. Ditto. Paratype. Upper lamella of fringe, posterior border slightly broken, showing great number of pits. Same horizon and locality. ×3.

Fig. 17. BU 301. *Tretaspis* cf. *granulata* (Wahlenberg). Internal cast of cephalon with upper lamella of fringe. Crugan Shales (Lower Ashgillian), Crugan Lane (Locality 2 of Matley, 1938, p. 593), Pwllheli. ×2.

Fig. 18. HM A602. *Tretaspis seticornis* (Hisinger). Internal cast of cephalon, showing upper lamella of fringe. Lower Drummuck Group (Ashgillian), south-east brow of Quarrel Hill (Locality 3 of Lamont, 1935, p. 300), Girvan, Scotland. Figured for comparison with same species from Pomeroy, County Tyrone. ×2.

XXXV.—*Note on alleged Viviparity in* Barbus viviparus, *and Description of a new Species of* Beirabarbus. By K. H. Barnard, D.Sc., F.L.S., South African Museum, Cape Town.

Thanks to the kindness of Dr. de Beaufort of the Amsterdam Museum, I was able to examine in 1939 all the original material (except one specimen) of *Barbus viviparus* Max Weber, 1897 (Zool. Jahrb. Abt. Syst. x. p. 153). One large specimen (64 mm. to end of caudal lobes) and a smaller one from Isipingo, and 25 specimens (17–49 mm. standard length) from Umhloti River, Verulam, were first examined. None had been opened for purposes of sexing. I opened them and found that the sexes could be distinguished in specimens from 35 mm. upwards. The ovaries in all the females were perfectly normal, containing a large number of normal-sized ova. The males were without intromittent organs.

Later, Dr. de Beaufort sent me a female which had been cut open and "the embryos fallen out of the body cavity and lying on the bottom of the glass." This specimen showed, however, that the stomach and intestine had been removed; the ovaries were nearly intact and contained a large number of normal-sized ova, and the supposed embryos lying loose in the tube were really the fry of a Cichlid.

Weber (*l. c.* p. 148) mentions that he obtained young fry from the mouths of the Cichlid "*Chromis philander*" in the Umhloti River at Verulam, one of the localities where he also obtained *B. viviparus*. And in the tube of 25 *B. viviparus* from Uhmloti River, as sent to me, there were also eight juvenile Cichlids.

It seems that the exigencies of field collecting, where often several items have to be put into one tube, have been responsible for this remarkable record of a viviparous *Barbus*. It is extremely unlikely that the one remaining specimen, a female "with embryos in the ovarium" mounted in the exhibited collection at Amsterdam, when it comes to be examined, will be found to justify its label.

Beirabarbus okavangœnsis, n. sp.

Depth of body less than head-length in young, equal to it in adult, not exceeding it at any stage. Eye 3½ in head. Pre-dorsal profile not elevated behind head. Snout rounded, shorter than eye, but subequal to it in some of the largest specimens. Mouth inferior. Barbels very small, even in the largest specimens not exceeding one-fifth eye-diameter, the posterior one only very little longer than anterior one. Gill-rakers 2+4 or 6 on first arch, short, knob-like, the lower ones very feeble. D iii. 8. A iii. 5. Pectoral reaching to, or almost to, ventrals in both sexes. Scales: lateral line 26–28, predorsal (8–)9, 3 between dorsal and lateral line, 2 between lateral line and ventral spine, 12 around caudal peduncle. Lateral line *straight from beginning to end*. Scales with 4–6 striæ on exposed field in smaller specimens, 6–8 in the largest. Each scale above lateral line, and less conspicuously the two series below it, with a greyish lunate or arrowhead-shaped spot; a blackish line from tip of snout to base of caudal rays, straight and *exactly following* the course of the lateral line tubules; dorsal and caudal fins salmon, anal fin also usually pinkish (cf. *B. aurantiacus*), front edge and tip of dorsal, and sometimes hind margin (cf. *B. rogersi*) more or less greyish.

A similar straight lateral line is found in *aurantiacus* and *rogersi*, both of which possess very short or minute barbels. If they also possess the sensory ridges (which are easily overlooked in poor specimens) a question of synonymy may arise

Described from 75 specimens, 27–65 mm. in length, from the Okavango River

Differs from *Beirabarbus palustris* Herre (1936, Proc. Biol Soc Wash. xlix p. 100), from Beira district, of which I have examined four paratypes, as follows:—In *palustris* the body-depth exceeds the head-length in specimens of 30 mm. and 60 mm length; the eye is relatively smaller, the predorsal profile is elevated. The lateral line shows a slight but distinct *downward bend* from its beginning to about the 12th scale, the dark lateral stripe, however, is straight, and consequently runs across the *upper part* of the 1st or 2nd to the 11th or 12th tubuliferous scales.

The remarkable feature of these two forms is the development of lines of minute " pores " (Herre " sensory ridges ") on the head. In the interorbital and internarial regions these structures appear as pale lines, more or less curved and intersecting, on the dark ground-colour. Similar lines occur on the preorbital, cheek and opercle, also on the lateral line tubuliferous scales and some of the neighbouring scales, chiefly on the shoulders and anterior part of body. They form a single transverse, slightly arcuate, line on the exposed field of each scale just behind the free margin of the preceding scale, and can scarcely be seen unless the specimen is removed from liquid and partially dried.

The types of *Barbus aurantiacus*, *rogersi*, and other species should be examined for these sensory ridges or pores. Whether they justify full generic rank being given to *Beirabarbus* is a question for future decision.

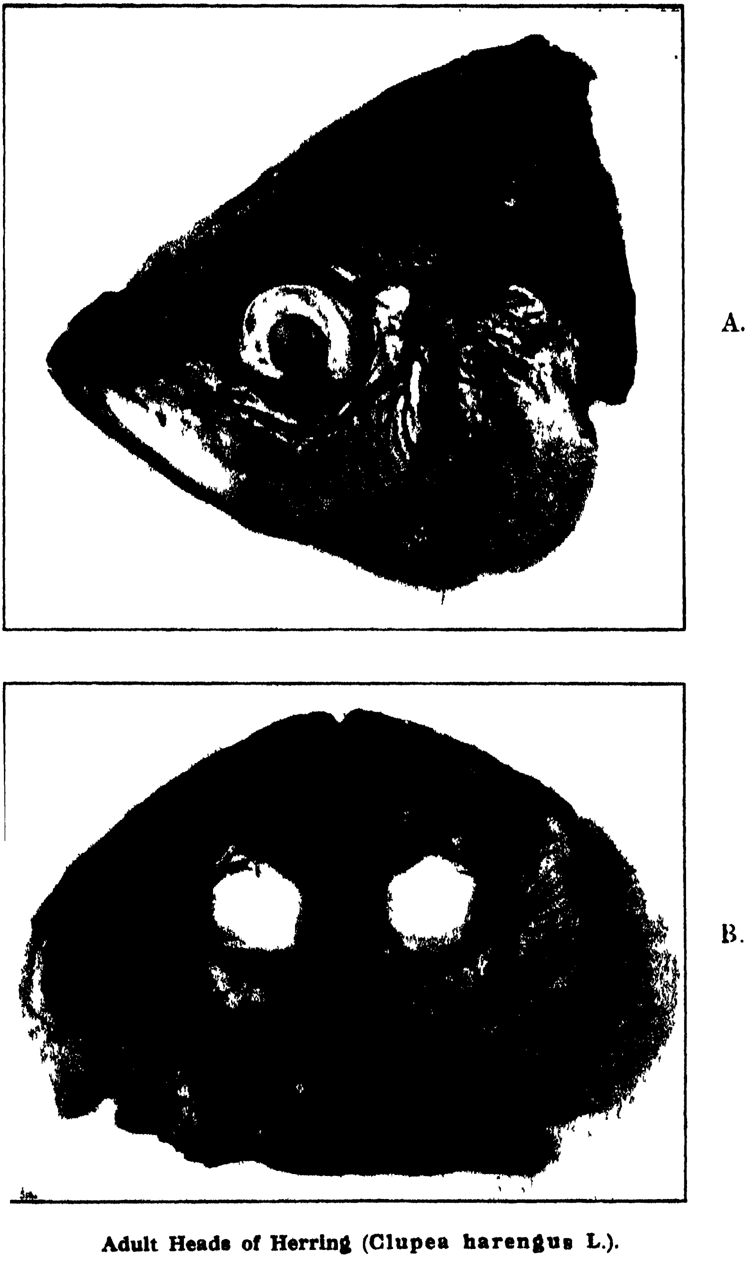
BIBLIOGRAPHICAL NOTICE.

The Herpetology of Hispaniola. By DORIS M. COCHRAN. United States National Museum Bulletin No. 117, 1941. 398 pp., text-figs. and plates.

THE Herpetology of Hispaniola, perhaps better known as Haiti (its western end) and San Domingo (its eastern end), has long been a special study of Miss Cochran's, and it is only natural, therefore, that this monograph should have been written by her.

Hispaniola is a comparatively small island, just south of Lat 20° N., and therefore well within the tropics. It is remarkable for the number of endemic forms which it contains. To quote the author's own words, "Out of 128 species and subspecies now know to inhabit Hispaniola, only six or seven are not indigenous. Of the 32 known genera, seven are found nowhere else." The number of racial forms that exist almost side by side is also interesting. *Leiocephalus*, for instance, has eleven distinct subspecies of *personatus*, seven of which are found on the mainland. And this on an island which is approximately only 400 miles long by 200 miles broad. Here, indeed, is a fine field for the geneticist and the student of speciation.

For the Museum worker the monograph is admirably done. All the species are fully described, and most of them are illustrated by text-figures. The references are full and presumably complete. The keys for genera and species ample. He who wants to identify an amphibian or reptile can turn to the work with confidence, but if he wishes to know anything about its life in the field, what it feeds on, how it behaves, how it breeds, he will be disappointed, for it is not there. That is a pity, for the living are so much more interesting than the dead. Moreover, as we are at last beginning to realise, particular habits, possibly based on structure, are often restricted to certain groups, and are therefore in their way just as diagnostic of the group as its physical characters. To have included field notes, and surely there are plenty available, would of course have considerably enlarged the work, but it would have been well worth it. M. A. S.



Adult Heads of Herring (Clupea harengus L.).

LAMONT. *Ann. & Mag. Nat. Hist. S. 11. Vol. VIII Pl. V.*

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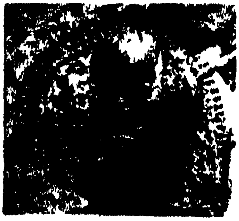
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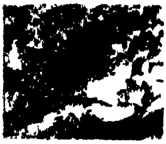
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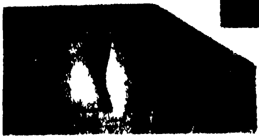
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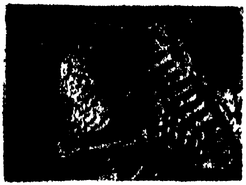
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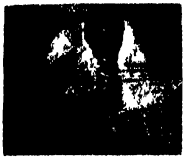
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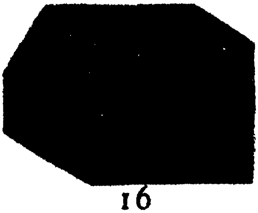
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A. L & D. M F. photo

Trinucleidæ.

THE
ANNALS AND MAGAZINE
OF
NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 48. DECEMBER 1941.

XXXVI. *New Species of* Staphylinidæ (*Col.*) *from the Philippines*. By MALCOLM CAMERON, M.B., R.N., F.R.E.S.

(Continued from p. 403.)

ALEOCHARINÆ (*con.*).

Falagria (*Stenagria*) *angusticeps*, sp. n. (Bernh. *in litt.*).

Shining, head and thorax black; elytra dark brown, the scutellum and vicinity reddish; abdomen with the first three visible tergites dark red, the following black. Antennæ brown, the first three segments reddish yellow. Legs blackish, the bases of the femora and tarsi reddish yellow. Length 3·5 mm.

In the shape of the head much resembling *dimidiata* Motsch., but differently coloured, the thorax narrower and the antennæ shorter. Head slightly broader than the thorax, the post-ocular region strongly retracted to the neck, scarcely perceptibly punctured. Antennæ long, a little thickened towards the apex, the penultimate segments as long as broad. Thorax longer than broad (2·75 : 2), the sides dilated and rounded at the middle, strongly retracted to the neck, finely sulcate along the middle except in front, with a few minute, scarcely visible punctures. Elytra as long as but a good deal broader than the thorax, practically impunctate. Abdomen a little narrowed at the base and apex, practically impunctate. The whole insect without ground-sculpture and glabrous.

Luzon: Balbalan. Type in my collection.

Falagria (*Stenagria*) *philippina*, sp. n. (Bernh. *in litt.*).

Colour and lustre of *concinna* Er., but smaller (2 mm.), the head orbicular, scarcely visibly punctured, antennæ of similar structure but a little shorter; thorax with the sides less dilated in front, the posterior angles less prominent, extremely finely and yet more sparingly punctured, elytra more finely and much more sparingly punctured; abdomen more sparingly punctured: in other respects like *concinna*.

Luzon: Balbalan. Los Banos. Type in my collection.

Atheta (*Microdota*) *variegata*, sp. n. (Bernh. *in litt.*)

Moderately shining; head dark reddish brown, reddish in front; thorax and abdomen bright reddish yellow, the latter with the 3rd and 4th visible tergites black, elytra yellowish brown. Antennæ and legs reddish yellow, the 4th to 10th segments of the former slightly infuscate. Length 1·4 mm.

In build much resembling *luctuosa* Kr., but much smaller and in other respects entirely different. Head broad but narrower than the thorax, extremely finely, closely and superficially punctured, the ground-sculpture feeble, coriaceous. Antennæ with the 3rd segment slightly shorter than the 2nd, 4th as long as broad, 5th to 10th gradually more transverse, the penultimate about twice as broad as long, the 11th as long as the three preceding together. Thorax transverse (2·75 : 2), the sides in front gently rounded, straighter and a little retracted behind, very finely, closely and somewhat roughly punctured; elytra slightly longer and broader than the thorax, slightly emarginate postero-externally, very finely, closely and roughly punctured. Abdomen a little narrowed before the apex, extremely finely, rather closely punctured throughout; ground-sculpture extremely fine. The whole insect with a very fine, moderately close yellow pubescence.

Panaon. A single specimen in my collection.

Atheta (*Microdota*) *multicarinata*, sp. n. (Bernh. *in litt.*).

Moderately shining; head black; thorax dark reddish brown; elytra smoky brown; abdomen black, the first two visible tergites reddish. Antennæ black, the first two segments brownish yellow. Legs reddish yellow. Length 1·3 mm.

A small obscurely-coloured species with large eyes as in *ocularis* Cam., and with rather long, moderately close pubescence. Head very finely, rather sparingly punctured, distinctly coriaceous. Antennæ with the 3rd segment shorter than the 2nd, 4th to 10th transverse, increasing in width, the penultimate twice as broad as long, the 11th as long as the 9th and 10th together. Thorax transverse (2·5 : 2), in the middle of the anterior half with a narrow impression, the puncturation very fine and obsolete, moderately close, the ground-sculpture as on the head. Elytra very slightly longer than the thorax, transverse, very finely, rather closely but not roughly punctured, finely coriaceous. Abdomen a little narrowed at the base and apex, very finely, moderately closely punctured on the anterior segments, much more sparingly behind and with fine transverse ground-sculpture.

♂: 8th tergite truncate, the posterior margin with very small closely placed denticles; 6th sternite a little produced and broadly rounded. In the single example the 8th tergite is retracted, only the posterior margin being visible.

Mindanao: Surigao. Type in my collection.

Atheta (s. str.) *philippina*, sp. n. (Bernh. *in litt.*).

Shining; head and thorax dark reddish brown, elytra yellow, the whole postero-external region from the sides at the level of the anterior and middle thirds to the apex of the suture infuscate. Abdomen with the first two visible tergites reddish yellow, the following black. Antennæ reddish, the first three segments and legs reddish yellow. Length 2 mm.

In size and build much resembling *dilutipennis* Motsch., but more brightly and differently coloured, the head a little more finely and not quite so closely punctured, the ground-sculpture similar at the base and sides but scarcely visible on the disc and front: antennæ longer, the 4th segment as long as broad, the 5th and following longer than in *dilutipennis* and so less transverse, the 11th, however, is longer, as long as the three preceding together. Thorax less transverse (4·2 : 3), less closely punctured, the ground-sculpture very weak; elytra scarcely as closely but finely punctured as in that species. Abdomen very sparingly punctured, almost impunctate behind and with very fine transverse ground-sculpture.

♂: unknown.

Sargao: Carbuntug. A single example.

Atheta (s. str.) *quinquedentata*, sp. n. (Bernh. *in litt.*).

Moderately shining; head dark reddish brown; thorax reddish yellow; elytra blackish, obscurely reddish yellow at the shoulders; abdomen reddish yellow, the 3rd and 4th visible tergites infuscate. Antennæ brown, the first two segments and the last lighter. Legs reddish yellow. Length 1·5 mm.

Head broad but narrower than the thorax, eyes moderate, about as long as the post-ocular region, extremely finely and closely punctured, finely coriaceous. Antennæ rather long, the 3rd segment as long as the 2nd, 4th and 5th as long as broad, 6th to 10th transverse, the penultimate about a half broader than long, the 11th about as long as the three preceding together. Thorax transverse (2·5 : 2), the sides evenly rounded, a little more retracted behind, the posterior angles rounded, along the middle of the posterior half narrowly and feebly impressed, extremely finely, closely and roughly punctured. Elytra as long as but broader than the thorax, not emarginate postero-externally, with fine, close rough sculpture, less fine than on the thorax. Abdomen slightly narrowed before the apex, finely and rather closely punctured, less closely on the 5th visible tergite. The whole insect with a fine, moderately close yellowish pubescence.

♂: unknown.

Leyte. A single specimen in my collection.

Atheta (*Dimetrota*) *quinquespinosa*, sp. n. (Bernh. *in litt.*).

Moderately shining; head dark reddish brown, reddish in front; thorax lighter reddish brown; elytra and abdomen pitchy, the posterior margins of the first four visible tergites narrowly rufescent, the posterior margin of the 5th and whole of the 6th reddish yellow. Antennæ black, the first three segments and the last reddish yellow. Legs reddish yellow. Length 2 mm.

Build of *lævana* Rey, the antennal structure as in *marcida* Er. Head broad, but narrower than the thorax, sometimes broadly impressed on the disk, very finely and closely punctured, finely coriaceous. Antennæ rather long and slender, the 4th to 6th segments slightly longer than broad, 7th and 8th as long as broad, 9th and 10th scarcely transverse, the 11th as long as the 9th and 10th together. Thorax transverse (4 : 3), the sides gently rounded in front, straighter and a little retracted behind, in the middle posteriorly sometimes with slight longitudinal impression, closely, finely and roughly punctured. Elytra a little longer and broader than the thorax, transverse, closely, finely and roughly punctured, but less finely than the thorax. Abdomen narrowed towards the apex, very finely, rather closely punctured and pubescent throughout. Middle and posterior tibiæ each with a fine seta about the middle.

♂: 8th tergite on each side with a long slender incurved spine, the margin between with three shorter and straight ones, the median the shortest; 6th sternite produced, narrowed and rounded at apex.

Luzon: Imugan. Panaon. Type in my collection.

Atheta (*Acrotona*) *obscuridens*, sp. n. (Bernh. *in litt.*).

Moderately shining; head dark reddish brown to black; thorax reddish yellow; elytra yellow; abdomen brownish yellow. Antennæ black, the first two or three segments brownish yellow. Legs reddish yellow. Length 2 mm.

In build much like *parva* Sahlb., but in all other respects different. Head orbicular, a good deal narrower than the thorax, finely and closely punctured. Antennæ with the 4th segment as long as broad, the following slightly transverse, 11th a little longer than the 9th and 10th together. Thorax transverse (3·5 : 2·5), the sides gently rounded and more retracted towards the front, less finely and less closely punctured than the head, less finely and less closely than in *parva*, and without ground-sculpture. Elytra slightly longer and very slightly broader than the thorax, more finely, more closely, and somewhat roughly punctured. Abdomen narrowed from base to apex, very finely, moderately closely punctured on the anterior segments, more sparingly behind, the pubescence long and coarse, the sides and apex with black setæ. Pubescence on the fore parts fine, yellow, moderately close. Middle and posterior tibiæ each with two black setæ.

♂: 8th tergite on each side with a short, stout, pointed tooth, the narrow margin between rounded.

Palawan: Binaluan. Mindoro: S. Theodoro. Type in my collection.

Atheta (*Acrotona*) *conica*, sp. n. (Bernh. *in litt.*).

Rather shining; fore parts clear reddish yellow; abdomen with the first visible tergite reddish, the 5th and 6th reddish yellow, the intermediate brown. Antennæ with the first three segments reddish yellow, the following brown, the 11th reddish. Legs reddish yellow. Length 1·5 mm.

Smaller than *orphana* Er., differently coloured, antennæ shorter and stouter, thorax a little shorter and so more transverse. Head broad but narrower than the thorax, finely, moderately closely, superficially punctured; ground-sculpture very fine, coriaceous. Antennæ with 3rd segment as long as the 2nd, 4th slightly, 5th to 10th gradually more transverse, the penultimate twice as broad as long, 11th longer than the two preceding together. Thorax transverse (3·75 : 2·5), finely, rather closely punctured as in *orphana*, but without ground-sculpture. Elytra scarcely longer but broader than the thorax, as closely but more finely punctured than in *orphana*. Abdomen finely, moderately closely punctured, and with long coarse pubescence. Fore parts with fine, moderately close yellow pubescence.

Mindoro: S. Theodoro. Type in my collection.

Atheta (*Acrotona*) *luzonica*, sp. n.

Very near *termitophila* Motsch., slightly larger, but of similar build, colour and lustre, the sculpture of the head scarcely differing, the antennæ similar in structure; the puncturation of the thorax is, however, much finer and closer and not at all rough, that of the elytra also distinctly finer, not quite so close and not rough; the abdomen scarcely differs in puncturation and pubescence from *termitophila* and the tibial setæ are the same, two on the middle and one on the posterior. Length 2 mm.

Luzon : Imugan. Type in my collection.

MIATHAMIA, gen. nov.

Facies of *Gnypeta* Thoms. Mouth-parts as in *Thamiaræa* Thoms. Temples not bordered. Pronotal epipleura visible from the side. Mesosternal process acute, extending two-thirds the length of the coxæ, these narrowly separated. Abdomen with the first three visible tergites transversely impressed at their bases, the anterior sternites not constricted or impressed. Tibiæ without distinct setæ. Posterior tarsi with the 1st segment distinctly longer than broad, longer than in *Thamiaræa*, as long as the 2nd. Type *opacicollis* var. *bakeri*, sp. n.

Miathamia opacicollis, sp. n. (Bernh. *in litt.* *Gnypeta*).

Moderately shining ; head and thorax dark reddish brown, the latter with the sides and base more or less broadly lighter ; elytra pitchy black, the base narrowly reddish yellow, the posterior margin more broadly yellow ; abdomen pitchy black, the first two visible tergites obscurely reddish, the 6th yellow. Antennæ reddish brown, the first three segments and the last reddish yellow. Legs reddish yellow. Length 2 mm.

Somewhat variable in the colour of the elytra and abdomen. (1) Abdomen with the first two visible tergites bright reddish yellow, var. *bakeri*, n. ; (2) only the shoulders reddish yellow, the rest of the elytra uniformly pitchy black, the abdomen with the first two visible tergites bright reddish yellow, var. *humeralis*, n.

Head transverse, suborbicular, narrower than the thorax, eyes moderate, closely covered with small superficial punctures. Antennæ with the 3rd segment longer than the 2nd, 4th to 7th all a little longer than broad, decreasing in length, 8th to 10th as long as broad, 11th a little longer than the 9th and 10th together. Thorax transverse (3·75 : 3), the sides rounded in front, retracted and slightly sinuate behind, the posterior angles obtuse, before the scutellum with a feeble impression and further in front with a pair of large but very superficial punctures, the sculpture fine, close and granular. Elytra longer (3·75 : 3) and broader than the thorax, transverse, the sculpture very similar. Abdomen a little narrowed before the apex, the first three visible tergites very finely, moderately closely punctured, the 4th and 5th more closely. Pubescence throughout fine, moderately close.

Leyte. Aroroy (type). Mindanao: Surigao (*Baker*).

Miathamia longicornis, sp. n. (Bernh. *in litt. Gnypeta*).

Rather narrower than *opacicollis* v. *bakeri* Cam. and less shining, but of the same size and colour; at once distinguished by the much longer and more slender antennæ, the 4th to 9th segments all much longer, the 10th as long as broad, the 11th longer than the 9th and 10th together; thorax narrower, very closely, moderately finely rather deeply punctured, subrugose, elytra with a similar puncturation, much coarser than in *bakeri*; middle and posterior femora infuscate.

Siargao: Dapa. Type in my collection.

Miathamia basiventris, sp. n. (Bernh. *in litt. Gnypeta*).

A little larger and more robust than var. *bakeri* Cam. and, except for the elytra, similarly coloured, these are yellow, broadly indeterminately transversely infuscate. The antennæ are similar in structure and the sculpture of the head and thorax scarcely differs, but that of the elytra is finer. In other respects similar. Length 2·75 mm.

Luzon: Los Banos. Type in my collection.

Amaurodera philippina, sp. n. (Bernh. *in litt.*).

Head shining, black; thorax dull, obscure purplish brown; elytra shining, brownish yellow; abdomen shining, the first three visible tergites obscurely reddish, the 4th and 5th black, the posterior margin of the latter narrowly reddish yellow, the 6th yellow. Antennæ and legs reddish yellow. Length 3·2 mm.

Colour, build and lustre of *similis* Cam., but with shorter antennæ, the thorax with much finer granular coriaceous sculpture, the elytra as finely but much more closely punctured; abdomen very finely and very sparingly punctured as in *similis*, the last tergite with gently rounded posterior margin and finely and closely denticulate. The head is a little broader than the thorax, very finely and very sparingly punctured and without ground-sculpture. The antennæ with the 3rd to 10th segments all longer than broad, decreasing in length, but much shorter than in *similis*, very like those of *veluticollis* Motsch.

Siargao : Dapa. Type in my collection.

Orphnebius glaberrimus, sp. n. (Bernh. *in litt. Astilbus*).

Shining, reddish yellow. Antennæ black, the first four segments and legs reddish yellow. Length 3·75 mm.

A parallel very shining, very sparingly punctured, robust species. Head transverse, suborbicular, a little narrower than the thorax, the eyes large ; with a few very fine punctures with black hairs. Antennæ short and stout, 3rd segment longer than the 2nd, 4th small, transverse, 5th and following much broader, the penultimate twice as broad as long, the 11th as long as the 8th to 10th together. Thorax transverse (6 : 4·5), the sides evenly rounded and equally retracted in front and behind, the posterior angles broadly rounded, impunctate, at the sides with four long black setæ. Elytra slightly longer and much broader than the thorax, slightly widened behind, transverse, with a few fine setiferous punctures. Abdomen parallel, practically impunctate and glabrous, the 5th visible tergite with close fine longitudinal rugæ, the 6th with a few setiferous tubercles ; sides with some black setæ.

Luzon : Mt. Makiling (*Baker*). Type in my collection.

Zyras sagax, sp. n. (Bernh. *in litt.*).

Shining, yellowish red. Antennæ and legs reddish yellow. Length 3·5 mm.

In build much resembling the subgenus *Trachydonia* Bernh. Head broad but narrower than the thorax, the eyes large and prominent, occupying the whole side ; with a few small obsolete punctures. Antennæ slender, but little thickened towards the apex, 2nd segment of moderate length, 3rd twice as long, the following all longer than broad, decreasing in length, the penultimate only slightly longer than broad, the 11th as long as the 9th and 10th together; thorax transverse (5·5 : 3·75), the sides rounded and dilated in front, rather strongly retracted and a little sinuate behind, the posterior angles obtusely rounded, a little before the base with a transverse punctured sulcus, elsewhere with a few flat obsolete scarcely visible punctures. Elytra longer (5 : 3·75) and broader than the thorax, coarsely and moderately closely punctured. Abdomen a little narrowed towards the apex, very finely and very sparingly punctured, the 5th visible tergite without longitudinal sulci. The whole insect without ground-sculpture and sparingly pubescent.

♂ ♀ : 8th tergite narrowed towards apex and nearly truncate, across the middle with a strong transverse keel.

Luzon : Los Banos. Type in my collection.

Zyras boettcheri, sp. n. (Bernh. *in litt.*).

Shining; head and thorax reddish brown; elytra brownish yellow; abdomen with the first two visible tergites yellow, the rest black. Antennæ black, the first two segments reddish yellow. Legs reddish yellow, the femora and tibiæ infuscate. Length 2 mm

In build somewhat like *sagax* Cam., but the eyes smaller and less prominent. Head broad but narrower than the thorax, transverse, suborbicular, eyes large but not occupying the whole side, practically impunctate. Antennæ short and stout, the 2nd segment short, 3rd twice as long, 4th to 10th transverse, increasing in width, the penultimate twice as broad as long, the 11th as long as the 9th and 10th together. Thorax transverse (4·5 : 3), the sides evenly rounded, retracted behind and coarctate with the base, the sides with three black setæ, the disc somewhat flattened, the puncturation extremely fine and very sparing. Elytra a little longer (3·5 : 3) and much broader than the thorax, the sides with three black setæ, practically impunctate. Abdomen a little narrowed before the apex and practically impunctate. The whole insect without ground-sculpture.

♂ : 8th tergite truncate, on each side with a stout tooth, the margin between closely and finely denticulate ; 6th sternite a little produced and broadly rounded.

Siargao : Dapa. Type in my collection.

Aleochara **(s. str.)** ***testaceipennis*, sp. n. (Bernh. *in litt.*).**

Shining; head, thorax and abdomen black, the thorax with the sides narrowly and obscurely reddish; elytra brownish yellow, the scutellary region and reflexed sides infuscate. Antennæ black, the 1st segment and legs reddish. Length 6·5 mm.

Size and build of *nigra* Kr. and with similar antennæ, differs in the colour of the elytra, the punctures of the thorax not quite so close, the puncturation of the elytra obviously finer and less close, the abdomen less punctured on the anterior tergites, but more strongly and less closely on the posterior. In other respects like *nigra*.

Mindoro: Subaon. S. Luzon; Mt. Isarog. Type in my collection.

Aleochara (*Euryodma*) *externemaculata*, sp. n. (Bernh. *in litt.*).

Shining; head black; thorax dark red; elytra black with large triangular yellowish-red marking postero-externally extending from about the middle of the reflexed margin to the posterior margin near the suture; abdomen with the first two visible tergites red, the following black. Antennæ black, the first four segments and legs red, the femora and tibiæ more or less infuscate. Length 3–5·5 mm.

Head with small, not very close punctures. Antennæ stout, the penultimate segments three times broader than long. Thorax slightly transverse (4 : 3·5), narrowed towards the front, finely, moderately closely punctured. Elytra as long as the thorax, not emarginate postero-externally, finely, closely, asperately punctured. Abdomen narrowed towards the apex, the first two visible tergites more finely and more sparingly punctured than the following, these with elongate rather close punctures much as in *croceipennis* Motsch. In all the specimens the 8th tergite is practically truncate and very finely and very closely and indistinctly crenulate. Pubescence of the fore parts yellow and moderately close.

Mindanao: Momungan. Type in my collection.

Aleochara **(*Polychara*)** ***triangulum*, sp. n. (Bernh. *in litt.*).**

In build, lustre and antennal structure resembling *puberula* Klug; the colour is also similar but the dark triangular sutural marking is much less distinct and the lateral absent; the puncturation of the head and thorax is a good deal finer than in *puberula*, that of the elytra as in that species but the abdomen is much less finely and less closely punctured, much as in *croceipennis* Motsch.: the pubescence of the fore parts as in *puberula*. Length 3 mm.

♂: 8th tergite broadly arcuately emarginate and very indistinctly crenulate.

S. Luzon: Mt. Isarog. Type in my collection.

Pseudoplandria densiventris, sp. n.
(Bernh. *in litt. Hoplandria*).

Shining pitchy black, the 8th tergite and posterior margin of the 7th yellowish. Antennæ black, the first two segments and legs reddish yellow. Length 3·5 mm.

In size, build and colour much resembling *punctiventris* Cam., but at once distinguished by the longer and more slender antennæ. Head sparingly punctured, the punctures somewhat larger than in *punctiventris*. Antennæ with the 3rd segment as long as the 2nd, 4th to 7th all slightly longer than broad, decreasing in length, 8th to 10th slightly transverse, 11th a little longer than the 9th and 10th together. Thorax in build and puncturation scarcely differing from *punctiventris*, the elytra, however, are as closely but less finely punctured than in that species, the punctures asperate and the abdomen is distinctly more finely and less closely punctured than in *punctiventris*, especially on the 4th and 5th visible tergites. The specimens before me present no sexual differences and are probably females.

Luzon: Heightsplan. Mt. Polis. Type in my collection.

Pseudoplandria philippinensis, sp. n.
(Bernh. *in litt. Hoplandria*).

Shining yellowish red, the disc of the thorax sometimes infuscate, the elytra often more or less extensively infuscate behind except the posterior margin. Antennæ with the first four segments and apical half of the 11th reddish yellow, the rest black. Legs reddish yellow. Length 3 mm.

Colour and lustre of *philippina* Bernh., but larger and more robust, the antennæ similarly constructed, but the thorax without quadrately placed punctures on the disc, the puncturation of the head and thorax extremely fine and scanty as in *philippina*, the elytra more finely and less closely punctured than in that species. The 1st and 2nd visible tergites are without punctures at their bases as in *philippina*, but the 3rd to 5th each with a transverse row of punctures not present in that species. In the ♂ the median keel of the 7th tergite is much shorter than in *philippina* (in which species it extends from the base to the posterior margin of the segment) and the lateral spine is much less developed, the 8th is feebly emarginate and furnished with five small teeth.

Luzon: Mt. Banahao. Type in my collection.

Pseudoplandria luzonica, sp. n.
(Bernh. *in litt. Hoplandria*).

Shining reddish yellow, the elytra pitchy black with the shoulders and posterior margin (narrowly) reddish yellow. Antennæ reddish yellow, the 9th to 11th segments blackish. Legs reddish yellow. Length 2·5 mm.

♂: colour and build of *philippina* Bernh., but with the antennæ a little longer and differently coloured, the elytra obviously more finely punctured, the punctures asperate as in that species, the 2nd to 4th visible tergites with fine close ridges not present in *philippina* and the first two are more punctured; the antennæ with the 4th to 7th segments distinctly longer than broad, 8th as long as broad, the 9th and 10th transverse, 11th as long as the 9th and 10th together. The 7th tergite has a flat tubercle in the middle before the posterior margin and is without the lateral spine seen in *philippina*; 8th tergite retracted in the single example. In other respects like *philippina*.

Luzon: Mt Polis. In my collection.

Pseudoplandria rufescens, sp. n.
(Bernh. *in litt. Hoplandria*).

Shining ferruginous red, the elytra pitchy black with the base and posterior margin (very narrowly) reddish yellow, the 4th and 5th visible tergites infuscate. Antennæ black, the first four segments and the last reddish yellow. Legs reddish yellow. Length 3 mm.

♀: a little larger and of darker colour than *luzonica* Cam., the antennæ shorter and stouter with yellow terminal segment, the 4th segment scarcely longer than broad, the 5th to 10th gradually more transverse, the penultimate twice as broad as long, the 11th as long as the 9th and 10th together. Elytra finely, closely and asperately punctured. Abdomen except for the fine punctures along the posterior margins of the tergites practically impunctate and without the longitudinal ridges seen in *luzonica*. In other respects similar to that species. From *philippina* Bernh. it differs in the larger size, more robust build, darker colour, and the thorax without four quadrately placed punctures.

♂: unknown

Luzon. Imugan. A single specimen in my collection.

Pseudoplandria iliganensis, sp. n.

Shining, ferruginous red, the elytra pitchy black with the shoulders and posterior margin (very narrowly and obscurely) reddish. Antennæ black, the first four segments and the last reddish yellow. Legs reddish yellow. Length 3 mm.

Colour of *masuriana* Cam., but smaller, the thorax much more finely and much more sparingly punctured, the elytra more strongly punctured, the abdomen less punctured. Head with a few extremely fine punctures. Antennæ with the 3rd segment as long as the 2nd, 4th slightly longer than broad, 5th to 10th transverse, the penultimate about one-and-a-half times broader than long, the 11th longer than the two preceding together. Thorax transverse (7 : 4·5), convex, the disc with four small quadrately placed punctures, extremely finely and sparingly punctured. Elytra broader and slightly longer than the thorax, closely, asperately punctured, more strongly in the ♂. Abdomen with the first two visible tergites impunctate at the base, finely and rather closely punctured elsewhere, the 3rd more strongly punctured throughout, the 4th and 5th sparingly.

♂: 7th tergite with a fine median keel; 8th narrowed, the posterior margin arcuately emarginate in its entire width and very finely and very closely denticulate.

Mindanao: Iligan (*Baker*). Panaon. Type in my collection.

Pseudoplandria piceorufa, sp. n.

(Bernh. *in litt. Hoplandria*).

Shining, head and thorax ferruginous red; elytra pitchy black with the shoulders reddish yellow; abdomen with the first two visible tergites reddish, the 3rd to 5th black, the 6th yellowish. Antennæ with the first four segments and apex of the last reddish yellow, the rest black. Legs reddish yellow. Length 3 mm.

♀: narrower than *iliganensis* Cam., the fore parts similarly coloured but the abdomen darker; antennæ similarly constructed but not so stout; thorax transverse (5·5 : 4), the disc with four small quadrately placed punctures, very finely and very sparingly punctured; elytra finely, closely and asperately punctured as in that species; abdomen much more sparingly punctured than in *iliganensis.*

♂: unknown.

Luzon: Subuagan. Type in my collection.

Pseudoplandria bakeri, sp. n.

Shining, black, the sides of the thorax obscurely reddish, the posterior margin of the 5th visible tergite yellow. Antennæ black, the first three segments and apex of the 11th reddish yellow. Legs pitchy, the tarsi yellow. Length 3 mm.

♂ (?): colour of *drescheri* Cam., but more robust, the antennæ longer, the sculpture of the elytra much coarser and granular, the abdomen less closely punctured, the legs darker. Head very finely and sparingly punctured. Antennæ with the 3rd segment as long as the 2nd, 4th to 7th all longer than broad, decreasing in length, the 8th to 10th as long as broad, the 11th as long as the 9th and 10th together. Thorax transverse (2·75 : 2), convex, with a few very small scattered punctures. Elytra a little longer and broader than the thorax, closely covered with small granules. Abdomen a little narrowed towards apex and except for a row of fine punctures along the posterior margins of the segments practically impunctate; 7th tergite with a transverse row of four small granules across the middle, near the posterior margin with a transverse row of much smaller and closely placed granules, the structure of the 8th not visible.

Mindanao: Surigao (*Baker*). A single specimen in my collection.

Pseudoplandria longecarinata, sp. n.
(Bernh. *in litt. Hoplandria*).

Shining, pitchy black or pitchy brown, the elytra darker. Antennæ with the first five segments and apical half of the 11th reddish yellow, the rest black. Legs reddish yellow. Length 3 mm.

Closely allied to *frugivora* Cam., of the same build, colour and lustre, but with the antennæ longer, the 4th and 5th segments distinctly longer than broad; the 7th to 10th rather less transverse than in *frugivora*, the 11th a little longer than the 9th and 10th together. Head very finely and very sparingly punctured. Thorax transverse (5 : 3), as finely but less closely punctured than in *frugivora* and without four quadrately placed punctures on the disc. Elytra longer than the thorax (4 : 3), longer than in *frugivora*, in the ♂ as closely but more strongly asperately punctured, more granular. Abdomen gradually narrowed towards the apex, the posterior margins of the tergites with a row of very fine punctures, the bases of the 3rd and 4th visible tergites with a transverse row of small punctures, otherwise impunctate.

♂: 7th tergite with a spine on the lateral margin; the posterior half in the middle with a keel longer than in *frugivora*; 8th arcuately emarginate and with five or six small denticles.

♀: unknown.

Luzon: Mt. Banahao. A single specimen in my collection.

Pseudoplandria latecarinata, sp. n.
(Bernh. *in litt. Hoplandria*).

Very closely allied to *longecarinata* Cam., but differs in the shorter antennæ, the 4th to 6th segments scarcely longer than broad and the ♂ characters. The elytra in the ♂ are much more finely and less closely punctured, less asperate, in the ♀ yet more finely, the median keel of the 7th tergite is shorter and weaker and the emargination of the 8th is without trace of denticles.

Luzon: Mt. Banahao. Type in my collection.

Pseudoplandria minima, sp. n.
(Bernh. *in litt. Hoplandria*).

Shining, yellowish red, the elytra orange-yellow. Antennæ with the first six segments reddish yellow, the following blackish. Legs reddish yellow, the tibiæ infuscate. Length 1·75 mm.

♂ : smaller than *philippina* Bernh., with shorter differently coloured antennæ and differently coloured, less finely punctured elytra. Head with a few very fine scattered punctures. Antennæ with the 3rd segment as long as the 2nd, 4th slightly longer than broad, 5th to 10th transverse, the penultimate nearly twice as broad as long, the 11th as long as the 9th and 10th together. Thorax transverse (4 : 2·3), convex, the disc without quadrately placed punctures, extremely finely and very sparingly punctured. Elytra longer than the thorax (3·5 : 2·3), rather closely and asperately punctured. Abdomen with a row of very fine punctures along the posterior margin of the segments, the 1st and 2nd visible impunctate at the base, 3rd to 5th with a basal row of punctures, otherwise impunctate ; 7th tergite with a fine median keel throughout ; 8th arcuately emarginate and very indistinctly crenulate.

Luzon : Imugan. Type in my collection.

Pseudoplandria cariniventris, sp. n.
(Bernh. *in litt. Hoplandria*).

Shining ; yellowish, red the elytra pitchy, the base and posterior margin narrowly reddish. Antennæ and legs reddish yellow. Length 1·5 mm.

Broader and more robust than *minima* Cam., with differently coloured elytra and antennæ, the latter not so stout.

♂ : head with a few minute punctures. Antennæ with the 3rd segment as long as the 2nd, 4th slightly longer than broad, 5th as long as broad, 6th to 10th transverse, the penultimate about a half broader than long, the 11th slightly longer than the 9th and 10th together. Thorax transverse (5 : 3), convex, without quadrately placed punctures on the disc, extremely finely and sparingly punctured. Elytra longer (3·5 : 3) and broader than the thorax, asperately punctured, the punctures coarser and not so close as in *minima*. Abdomen, except for the punctures along the posterior margins of the tergites, impunctate, the 5th and 6th each with six fine longitudinal ridges, the 6th also with a short pointed tooth on the lateral margin, 7th with a narrow median keel, the 8th retracted, its structure not visible.

♀: unknown.

S. Luzon: Mt. Isarog. Type in my collection.

Key to the Phillipine species of Pseudoplandria.

1. Black or pitchy black species .... 2.
Reddish or yellowish red species .... 5.
2. Abdomen closely and distinctly punctured on the anterior tergites .... *densiventris* Cam.
Abdomen sparingly or very sparingly punctured .... 3.
3. Penultimate segments of antennæ as long as broad .... *bakeri* Cam.
Penultimate segments of antennæ distinctly transverse .... 4.
4. Antennæ longer, the 5th and 6th segments a little longer than broad; sculpture of elytra coarser .... *longecarinata* Cam.
Antennæ shorter, the 5th and 6th segments scarcely longer than broad; sculpture of elytra finer .... *latecarinata* Cam.
5. Antennæ entirely reddish yellow .... *cariniventris* Cam.
Antennæ in part black or infuscate .... 6.
6. Abdomen with the 2nd to 4th visible tergites with fine close longitudinal keels .... *luzonica* Cam.
Abdomen without such keels .... 7.
7. Thorax with four larger quadrately placed punctures on the disc .... 8.
Thorax without such punctures .... 10.
8. Larger, 3 mm., and more robust; antennæ stouter, 4th segment very slightly longer than broad .... 9.
Smaller, 2·5 mm., and narrower; antennæ more slender, 4th segment distinctly longer than broad .... *philippina* Bernh.
9. More robust; abdomen entirely red, 2nd to 5th visible tergites with more numerous punctures.......................... *iliganensis* Cam.
Narrower; abdomen darker, the 3rd and 4th visible tergites black, the 2nd to 5th with fewer punctures .... *piceorufa* Cam.
10. Larger, 3 mm........................... 11.
Smaller, 1·75 mm., 11th segment of antennæ black .... *minima* Cam.
11. More robust; antennæ stouter, 4th segment very slightly longer than broad, 5th as long as broad .... *rufescens* Cam.
Narrower; antennæ thinner, 4th and 5th segments a little longer than broad ...... *philippinensis* Cam.

ADDENDA.

OXYTELINAE.

Delopsis bakeri, sp. n. (Bernh. *in litt.*).

Fore parts dull; head black, thorax and elytra pitchy black; abdomen a little shining, yellowish brown. Antennæ black, the 2nd and 3rd segments yellowish brown. Legs reddish yellow. Length 2 mm.

Near *extensicornis* Fauv., but at once distinguished by the yet longer and more slender antennæ and coarser sculpture of the fore parts. Head transverse, nearly as broad as the thorax, the eyes small, the postocular region slightly dilated and rounded with the posterior angle, the depressed clypeus shining, finely granular, the basal region broadly, superficially impressed and finely rugose, the post-ocular more coarsely and without distinct punctures. Antennæ long and slender, the 1st segment elongate, slightly thickened towards the apex and finely granular, 2nd a good deal shorter, 3rd considerably longer than the 2nd, 4th a little longer and stouter than the 3rd, 5th to 10th all much longer than broad, cylindrical, the 11th as long as the 9th and 10th together. Thorax transverse (3·2 : 2·3), trapezoidal, the sides feebly denticulate, along the middle with narrow superficial groove, before the base on each side with a small, round, superficial fovea, towards the sides distinctly impressed, the whole surface coriaceous and rugose without distinct punctures. Elytra a little longer and broader than the thorax, finely striate and granular. Abdomen finely, moderately closely, asperately punctured.

Luzon: Mt. Makiling (*Baker*). Panaon. Type in my collection.

Delopsis media, sp. n. (Bernh. *in litt.*).

Very near *extensicornis* Fauv.; the antennæ similarly constructed, but of more robust build, the post-ocular region scarcely dilated, the sculpture a little coarser; thorax less transverse (4 : 3), the sculpture distinctly coarser as is that of the elytra. In other respects like *extensicornis*. Length 2 mm.

Luzon: Balbalan. Type in my collection.

Delopsis curticornis, sp. n. (Bernh. *in litt.*).

Differs from both the preceding species in the much shorter antennæ and less dull fore parts. Head distinctly narrower than the thorax, the eyes larger than in the above species, the post-ocular region scarcely dilated; clypeus shining and with a few interrupted striæ, the disc with narrow, deep sulcus, the base on each side with a round fovea, the surface closely striate, the striæ distinctly coarser than in either *extensicornis* Fauv. or *media* Cam. Antennæ with the 3rd segment as long as, but more slender than the 2nd, 4th as long as broad, 5th and following stouter, as long as broad, the 7th to 10th differing but little from one another, 11th slightly longer than the 10th. Thorax trapezoidal, transverse (3·5 : 2·75), more uneven than in the above species, the sulci also longer and deeper, the rugæ much coarser, the elytra also with coarser rugæ and striæ. Abdomen very finely moderately closely, scarcely asperately punctured. Length 2 mm.

Luzon : Ballalan. Type in my collection.

Paragonus philippinus, sp. n. (Bernh. *in litt.*).

Moderately shining, pitchy black. Antennæ and legs reddish yellow. Length 2·4 mm.

Colour, build and lustre of *heterocerus* Fauv., the antennæ similarly constructed, but with the elytra a little longer, the head and thorax more coarsely punctured, the elytra distinctly longer than the thorax (4 : 3), as closely but less roughly punctured than in that species.

Masbate : Aroroy. Type in my collection.

Paragonus bakeri, sp. n. (Bernh. *in litt.*).

Shining, light reddish brown, the base of the head and postero-external angles of elytra infuscate. Antennæ and legs reddish yellow. Length 2·5 mm.

Narrower and more brightly coloured than *philippinus* Cam., the antennæ similarly constructed, the head and thorax much more coarsely punctured, the sides of the latter in front of the constriction more rounded, along the middle with rather broad impunctate space, transverse (4·5 : 3); elytra longer than the thorax (4·5 : 3) and as coarsely punctured; the punctures of the abdomen larger than in *philippinus* but superficial.

Mindanao: Surigao. Type in my collection.

Paragonus spectabilis, sp. n. (Bernh. *in litt.*).

Shining, light reddish brown. Antennæ and legs reddish yellow. Length 3 mm.

Colour and lustre of *bakeri* Cam., but with differently constructed antennæ, shorter elytra, coarser puncturation, especially of the elytra and abdomen. Antennæ shorter and stouter than in *bakeri*, the 4th to 6th segments orbicular, 7th to 10th transverse and increasing in width. Thorax longer than in *bakeri*, less transverse (5 : 4), the sides before the constriction straighter and longer, along the middle with rather broad impunctate space; elytra as long and as broad as the thorax behind, a little narrower at the base very coarsely and closely punctured. Abdomen more coarsely and more deeply punctured than in *bakeri*.

Luzon: Imugan. Type in my collection.

Osorius mephistopheles, sp. n. (Bernh. *in litt.*).

Colour and build of *furcifer* Bernh., but differing in the following respects: the ridges and striæ between the eyes are more numerous, less interrupted, and more defined, elsewhere practically without sculpture except on the frontal processes, which are striate as in *furcifer*; thorax similarly impressed near the posterior angles, but the sides with larger and more numerous punctures, the dorsal row of eight or nine punctures are also a little larger, but the still larger puncture before the middle seen in that species is absent, there is, moreover, an extremely fine, not very distinct and moderately close puncturation all over, the scattered punctures of the elytra are less obsolete, the sculpture of the abdomen, however, scarcely differs. Length 9 mm.

Luzon: Mt. Polis. Type in my collection.

Osorius impressiceps, sp. n. (Bernh. *in litt.*).

Shining, black, the anterior and posterior margins of the thorax narrowly reddish; elytra reddish, extensively infuscate behind (? immature). Antennæ and legs reddish yellow. Length 7·75 mm.

Build of *mephistopheles* Cam., but smaller, the frontal processes shorter, the whole head except the base, a narrower area along the frontal margin and the antennal tubercles closely, finely, and uninterruptedly striate. the whole declivous part superficially impressed also; thorax with the punctures of the dorsal row finer, the lateral scarcely differing from *mephistopheles*, and with the fine ground-puncturation seen in that species: the sculpture of the elytra and abdomen scarcely differing from that of *mephistopheles*.

Siargao · Dapa. Type in my collection.

Osorius basipennis, sp. n. (Bernh. *in litt.*).

Shining, black, the base of each elytron with a large obscure reddish marking; front on each side with broad triangular process Antennæ and legs reddish yellow. Length 6·5 mm.

Build of *furcifer* Bernh., but readily distinguished by the colour of the elytra and also differs in the following respects: the frontal processes are shorter and broader, finely and closely striate, the whole head, including the declivous front, is closely uniformly and finely striate, only a large area at the base of each process smooth; thorax scarcely differing in shape, but the impression at the side behind not so deep or extensive, the dorsal row of punctures on each side of the middle finer and more numerous, and without the large puncture before the middle seen in that species, the sides very finely and very sparingly punctured; sculpture of elytra very similar in both species, but that of the abdomen is finer and more scanty.

Luzon: Los Banos. Type in my collection.

Osorius unicornis, sp. n. (Bernh. *in litt.*).

Colour and build of *furcifer* Bernh., but at once distinguished by the asymmetrical head, only a single process on the right side being present, the left anterior angle simply rounded and not at all produced; the striæ and rugæ are limited as in that species to the interocular region, but they are finer, less interrupted, and more numerous, the rest of the surface without sculpture; the impression at the posterior angle of the thorax is less extended, the dorsal row of eight or nine very obsolete punctures is without the larger puncture before the middle seen in *furcifer*, the puncturation at the sides very scanty and obsolete; elytra scarcely differing in sculpture, but the abdomen is more finely and much less closely punctured than in that species. Length 7 mm.

Luzon: Imugan. Type in my collection.

Osorius proximus, sp. n. (Bernh. *in litt.*).

Build, colour, and lustre of *luzonicus* Bernh., but a little narrower, the rugæ and striæ of the head a little finer, the median impunctate area of the thorax a little narrower, elsewhere with closer, deeper, more rugose puncturation than in that species, that of the elytra also is closer, deeper, and rougher, that of the abdomen scarcely differing from that of *luzonicus*. Length 3·75 mm.

Luzon: Laguna. Type in my collection.

Osorius brunneipennis, sp. n. (Bernh. *in litt.*).

Shining, head and abdomen black, the former reddish in front, the latter with the posterior margins of the tergites narrowly reddish; thorax pitchy black, the anterior and posterior borders narrowly reddish; elytra reddish brown, infuscate behind. Antennæ and legs reddish yellow. Length 3 mm.

Build of *proximus* Cam., but smaller and narrower and differently coloured, the striæ and rugæ of the head less numerous, the rugæ on the declivous part broken up into small elongate granules, the frontal margin truncate as in *proximus*; thorax with narrow impunctate median area, the puncturation elsewhere much finer, less close, and not rugose, more resembling that of *luzonicus* Bernh., but finer; elytra finely, moderately closely, but not roughly punctured; abdomen finely, less closely punctured than in *proximus*.

S. Luzon: Mt. Isarog. Biliran. Type in my collection.

Osorius brachypterus, sp. n. (Bernh. *in litt.*).

Shining, ferruginous red, the abdomen at apex more or less infuscate. Antennæ and legs reddish yellow. Length 2·2 mm.

An abnormal species, in the almost complete absence of sculpture and the structure of the antennæ resembling a *Holotrochus* Er., but the anterior and middle tibiæ are distinctly dentate. Head with a few very small punctures, the anterior border truncate, the angles rounded. Antennæ with the 3rd segment small, much shorter than the 2nd, 4th small, transverse, 5th and 6th a little broader, equal, 7th distinctly more transverse, 8th to 10th yet more transverse and differing but little, 11th as long as the 9th and 10th together. Thorax transverse (4·5 : 4), trapezoidal, the anterior angles somewhat prominent, the posterior rounded and without impression adjacent, finely and sparingly punctured. Elytra as long and as broad as the thorax, impressed at the base, impunctate. Abdomen with transverse row of small obsolete punctures a little before the posterior margins of the first four visible tergites, otherwise practically impunctate and with a few short hairs. The whole insect without ground-sculpture and with glabrous fore parts.

Panaon. Pinutan. Type in my collection.

Osorius microphthalmus, sp. n. (Bernh. *in litt.*).

Moderately shining. Entirely yellow. Length 1·5 mm.

Readily recognised by the colour, short elytra and sculpture. Head without sculpture in front, elsewhere rather closely covered with small, superficial, obsoletely umbilicate punctures, the eyes minute. Antennæ reaching the base of the thorax, the 3rd segment much shorter than the 2nd, 4th small, transverse, 5th broader, 6th to 10th gradually increasing in width, the penultimate nearly twice as broad as long, 11th short, conical. Thorax transverse (3 : 2·2), the sides straighter and more retracted behind, the anterior angles rounded, the posterior obtuse with feeble impression adjacent, the punctures similar in character to those of the head, but rather closer and distinctly umbilicate. Elytra shorter than the thorax (1·75 : 2·2), transverse (3 : 1·75), the punctures close, about as large as those of the thorax, but superficial. Abdomen finely, rather closely punctured and finely coriaceous. Fore parts feebly coriaceous; pubescence scanty yellow.

Pinutan. Type in my collection.

XXXVII.—*Spolia Mentawiensis*: *Rhopalocera*, Pieridæ.

By A. Steven Corbet. British Museum (Natural History).

The Mentawi Islands, which lie off the west coast of Sumatra, and were visited by Messrs. C. Bodon Kloss and N. Smedley in the latter part of 1924, consist of Siberut, Sipora and the North and South Pagi Islands. The most recent bathymetric map (1938, *Atlas van Tropisch Nederland*) shows these Islands are joined at the 200 meter level to the Batu Islands by a very narrow ridge, and these latter islands are connected with the Sumatran mainland at the same level Simalur, Nias and Engano lie outside the 200 meter level, the last-named island being separated from its nearest neighbours by depths of more than 1,000 meters. On the other hand, the sea channel separating the Mentawi Islands from the Sumatran mainland is much deeper (*ca* 1,500 meters) and wider than is that separating Nias and Sumatra (600–700 meters), and herein may lie the explanation of the fact that the fauna of the Mentawi Islands is more highly differentiated from that of the Sumatran mainland than is found to be the case with the neighbouring islands of Nias and Batu. In the list which follows, the few specimens taken by Dr. Karny, who visited these islands at the same time, are placed in brackets. A few butterflies taken by the above-mentioned collectors in Pulau Tello (one of the Batu Islands) and in Padang, West Sumatra, are also included. Siberut was visited in September and October 1924, Sipora in October and November, North Pagi in October, and Pulau Tello and Padang in November.

Appias albina albina (Bsdv.). Siberut, ♂.

What is almost certainly the type of *neombo* (Bsdv.) has been found in the Oberthür Collection, and it is identical with females from Amboina in the same collection. It differs from East Javan females, but some females from Sumatra and Palawan are identical.

Appias paulina cæca, subsp. n. Sipora, 2 ♂♂.

Upperside bluish grey, without black dusting, and with the vein-endings above vein 1 on the forewing and above vein 3 on the hindwing broadly blackened.

Underside bluish grey as above, but tinged yellowish on the apical third of the forewing and the whole of the hindwing The characteristic black spot in space 3 on the forewing found above and below in the Niasese subspecies *mata* (Kheil) is entirely absent above in *cæca* but very faintly indicated below

Forewing 28 mm in holotype. Second male smaller.

For some unexplained reason certain authors have regarded the Ceylonese and South Indian races of this widespread species as specifically distinct from the more easterly forms I have been unable to find any means of separating *paulina* (Cram.), Ceylon, *wardi* (Mre.), South India, *mata* (Kheil), Nias, and *ega* (Bsdv.), Australia, from *leis* (Hbn), Java, and have no doubt whatever that these constitute a single species. At the same time, there appears to be no difference in male genitalia or in hair pencils between *A. paulina* (Cram.), *A. albina* (Bsdv), *A. nero* (F.), *A melania* (F.) and *A. celestina* (Bsdv), although in some cases the male wing contours differ and the distribution is against conspecificity.

Cramer's figure of the type of *Papilio paulina*, 1777 (Pap. Exot. ii. p 21, pl. cx. figs. E, F), is clearly a female of the wet-season form, although Moore allocated it to the dry season. Its origin was probably Ceylon, as stated by Moore, and not "Côte de Coromandel" or "Java," as given by Cramer.

Appias indra klossi, subsp. n. Siberut, 4 ♂♂ (including type); Sipora, ♂.

Differs from all the Malaysian races of *A. indra* (Mre.) in the much narrower black forewing border on both surfaces. Underside entirely white, almost imperceptibly yellow-tinged at the base of the hindwing; forewing apex not ashy yellow as in the Malaysian forms, but greenish black, with a series of four diffuse white spots.

Forewing 29 mm. in holotype. The four other males smaller, mean length of forewing being 25 mm.

Saletara panda auriflora Fruh. Siberut, ♀.

Agrees with Fruhstorfer's figure of a female from Pulau Tello (in Seitz, Grosschmett. Erde, ix, pl. 62 *a*, 3).

Catopsilia pyranthe pyranthe (L.). Padang, ♀.

Catopsilia crocale crocale (Cram.). Siberut, ♀; Sipora, 3 ♀♀; Padang, 3 ♂♂, ♀.

The above specimens all pertain to the *crocale* and not to the *pomona* group of forms, the males being f. *alcmeone* (Cram.) and the females f. *jugurtha* (Cram.).

Eurema hecabe cephrens, subsp. n. Siberut, 9 ♂♂, 6 ♀♀; Sipora, 16 ♂♂, 7 ♀♀, 1 gynandromorph (left side ♂), (♂).

♂. Upperside nearest to subsp. *satellitica* (Fruh.), Nias, but the yellow colour slightly paler and the hindwing black border more diffuse and only half as wide. Underside as in *satellitica*, but markings usually fainter. Forewing 22 mm.

♀. Nearest to subsp. *latilimbata* (Btlr.), North-east Sumatra, but paler and with hindwing black border hardly half as wide.

Underside much paler than in Sumatran females, and markings usually only barely visible. Forewing 23 mm. Both types from Sipora.

Eurema hecabe telloana, subsp. n. Pulau Tello, 3 ♂♂, 3 ♀♀ (4 ♂♂).

♂. Upperside differs from *satellitica* in the slightly less intense yellow colour and the regular and clearly defined black hindwing border being about two-thirds as wide. Underside markings usually fainter than in the Niasese race. Forewing 20 mm.

♀. Nearer to the Sipora than to the Niasese race, but differing from the former in the much paler and more greenish-white colour and in the broader black hindwing border. Underside markings almost obsolete. Forewing 23 mm.

Eurema hecabe latilimbata (Btlr.). Padang, 4 ♂♂, 2 ♀♀.

Eurema blanda snelleni (Mre.). Siberut, ♂; Sipora, 2 ♂♂. The Siberut male is small, forewing 15·5 mm.

Eurema andersonii andersonii (Mre.). Siberut, 2 ♂♂, ♀.

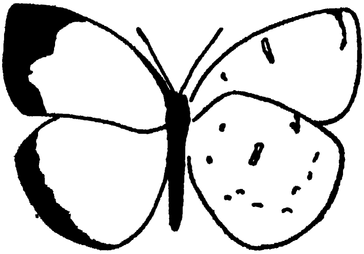
Eurema sari sodalis (Mre.). Padang, ♂.

Eurema mentawiensis, sp. n. (fig. 1). Siberut, ♂, 3 ♀♀; Sipora, 6 ♂♂, 3 ♀♀.

♂. In size and general appearance recalls *E. simulatrix* (Semp.), but the colour is deeper chrome-yellow, the forewing black border is more uniform and not so deeply indented between veins 2 and 4, and slopes inwards sharply from vein 2 to the inner margin, while the hindwing black border is broader (2·0 mm. at vein 5), and its inner edge is sinuate and slightly diffuse.

Underside colour and markings as in *E. tilaha lamperti* (Fruh.), there being a single cell-spot, and a short and faint ferruginous subapical stripe parallel to the termen on the forewing, and no spot at the base of space 7 on the hindwing. The post-discal spot in space 4 on the hindwing is moved inwards more than in *lamperti*, and the markings in the tornal half of the hindwing are as distinct as those in the costal half. Forewing 24 mm.

Fig. 1.



Male holotype of *Eurema mentawiensis*, sp. n., Sipora.

♀. Forewing very rounded. Upperside milky white, with a slight greenish tinge in the outer areas. Black bordering as in the male, but that on the forewing rather broader and slightly more diffuse, while that on the hindwing has its inner edge so diffuse that the sinuations are lost.

Underside more yellow than above, with markings as in the male. Forewing 21 mm. Types from Sipora. One Sipora ♂ with forewing 16 mm.

Eurema mentawiensis trinens, subsp. n. North Pagi Is., ♀.

Upperside very pale lemon-yellow, with the colour more intense in the outer areas, and with the black borders as in *mentawiensis* female, except that that on the forewing is more diffuse.

Underside very pale yellow, paler thon in *lamperti* female, and with markings as in *mentawiensis* female. Forewing 23 mm.

The male genitalia of *E. mentawiensis* are unlike those of any other member of the *sari* section, which is characterized by the single cell-spot on the underside of the forewing. In *E. mentawiensis* the arrangement of hooks on the clasper is similar to that found in *E. simulatrix*, but the facies of these two butterflies are so different that it would be unreasonable to place the Mentawi insect as a race of *E. simulatrix*, which occurs from Burma to the Philippines and Celebes with very little geographical variation.

As *E. mentawiensis* is the third *Eurema* species to be added to the *sari* section since the Indo-Australian species were revised by Corbet and Pendlebury (1934, Bull. Raffles Mus. vii. pp. 143–193), it may be as well to summarize the present position in this section :-

E. andersonii (Mre.) : Ceylon to Sikkim, Neomalaya and Java. Clasper with three apical hooks and a small point on the dorsal edge of the clasper (absent in the Ceylonese race) (fig. 2).

Fig. 2.

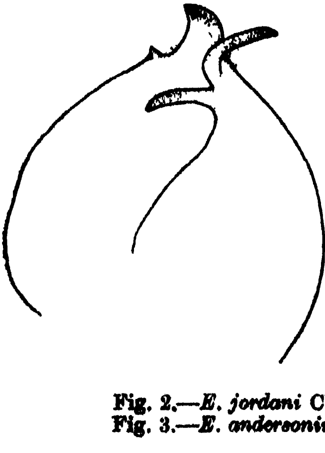


Fig. 3.

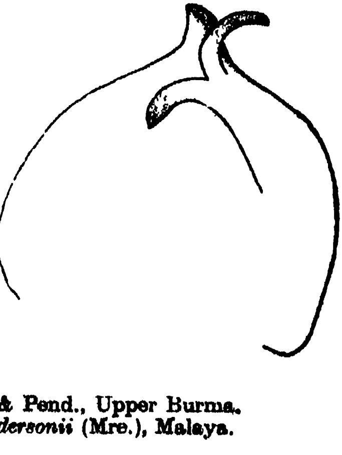


Fig. 2.—*E. jordani* Cbt. & Pend., Upper Burma.
Fig. 3.—*E. andersonii andersonii* (Mre.), Malaya.

E. jordani **Cbt. & Pend. : Sikkim to Burma. Clasper with three apical hooks (fig. 3).**

E. lacteola (Dist.) : Malaya, Sumatra and Java. Clasper with four apical hooks (fig. 4).

E. lombokiana (Fruh.) : Lesser Sunda Islands east of Bali. Clasper with four apical hooks and a small inner hook (fig. 5).

Fig. 4.

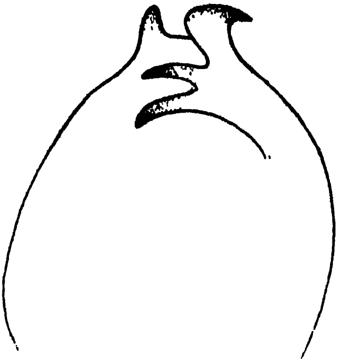


Fig. 5.

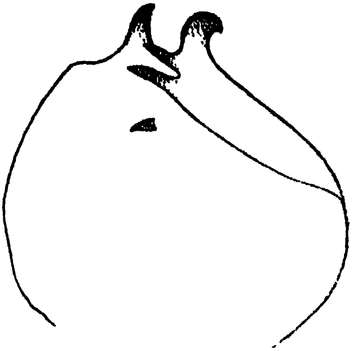
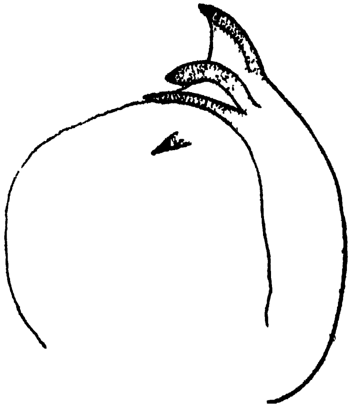


Fig. 4.—*E. lacteola lacteola* (Dist.), Malaya.
Fig. 5.—*E. lombokiana* (Fruh.), Sumbawa.

E. sari (Hsf.) : Burma, Neomalaya and Java. Clasper with three apical hooks.

Fig. 6.



E. mentawiensis, sp. n., Sipora.

E. mentawiensis, sp. n. : Mentawi Islands. Clasper with three apical hooks and a small inner hook (fig. 6).

E. tilaha (Hsf.): Southern Burma, Neomalaya and Java, to the Philippines and Celebes. Clasper with three apical hooks and a further large, broad and flat apical process.

Since the types of the Fruhstorfer Collection reached the British Museum, it has been found that *varga* (Fruh.) is the Javanese race of *E. lacteola* (Dist.) and not a form of *E. ada* (Dist. & Pryer) as was hitherto supposed. Hence, *montivaga* (Roepke) falls to *E. lacteola varga* (Fruh.), and for the unnamed Javanese race of *E. ada* I propose **E. ada roepkei**, nom. nov., pro *Terias ada varga* Roepke (*nec* Fruhstorfer), 1935, Rhop. Java, i. p. 84, pl. xi. fig. 3, ♂.

Eurema tilaha lamperti (Fruh.). Siberut, 14 ♂♂, 10 ♀♀ (2 ♂♂, 2 ♀♀); Sipora, 3 ♂♂, 3 ♀♀ (3 ♀♀).

The above specimens are probably referrable to *lamperti*, described from Pulau Tello, although the forewing black inner border is hardly narrower than in the nominotypical form from Java.

Gandaca harina beruta, subsp. n. Siberut, ♂ (♀).

♂. Upperside pale yellow, intermediate between subsp. *distanti* Mre., Sumatra, and *elis* Fruh., Borneo, but the forewing black apical border is slightly narrower and much paler. Colour of underside intermediate between that of Sumatran and Bornean males. Forewing 21 mm.

♀. Upperside colour as in *elis* female, but the forewing black border narrower, inner edge more diffuse and paler in colour. Hindwing black border almost obsolete. Underside very slightly paler than in *elis*. Forewing 21·5 mm.

Gandaca harina porana, subsp. n. Sipora, 2 ♂♂; North Pagi Is., ♂.

Above and below as in subsp. *beruta*, but the black apical border on the forewing only about two-thirds as wide, much paler and with a more even edge. Forewing 23 mm. Type from Sipora.

The only Pierid recorded from the Mentawi Islands which is unrepresented in the present collection is *Delias hyparete hypopelia* Hagen, known only from the unique type in the Munich Museum.

XXXVIII.—*Descriptions and Records of Bees.*—CLXXXII.

By T. D. A. Cockerell, University of Colorado.

Nomia desolata, sp. n.

☿.—Length about 9·5 mm., anterior wing about 7·8.

Robust, the head and thorax black, the abdomen mainly pale dull orange-fulvous, but the elevated, coarsely punctured parts of first two tergites black, only the broad depressed shining apical margins fulvous; tegulæ not enlarged, very dark, faintly reddish. Wings hyaline, with an apical dark cloud; stigma and nervures dark brown. Legs black, the hind tarsi pale reddish; pubescence white, dense on face and cheeks, scanty on thorax above, but abundant on sides, almost lacking on abdomen above, but dense and short beneath; abundant on hind tibiæ and basitarsi. Head broad, approximately circular seen from in front, tongue rather short, mandibles reddish in middle; antennæ black; front and vertex dull, a shining spot laterad of each lateral ocellus; mesonotum coarsely punctured, glistening between the punctures; scutellum unarmed, the punctures very large and well separated, the intervals shining; area of metathorax with a narrow basal band, crossed by strong ridges; posterior face of metathorax almost bare; basal nervure falling a short distance short of nervulus; second cubital cell about square, receiving recurrent nervure not far from end; spurs pale. Abdomen without bands, except a little short glistening hair at sides of tergites; apex extirely pale. In one specimen the hind tergite is broadly black at base.

S. Rhodesia: Lonely Mine, Mataleleland, Jan. 8 to 13, 1915 (*Dr. H. Swale*). Four specimens. Related to the group of *N. rubella* Smith, in my table in Ann. & Mag. Nat. Hist., Sep, 1939; running near to *N. nubicincta* Ckll., but differing in the tegulæ, the strongly punctured basal tergites, and other respects.

Nomia brachysticha, sp. n.

♂.—Length nearly 9 mm., anterior wing about 8.

Moderately robust, head and thorax black, Abdomen reddish testaceous, the tergites with black bands before the shining apical depressions, these bands not nearly reaching the margins, but not interrupted in middle, the first band shortest and not very broad, the others broad, their ends truncate; head broader than long; tongue slender, not very long; face densely covered with white hair; front and vertex dull, except a shining lunule at each side of ocelli; antennæ black, rather short for a male; mesonotum and scutellum dull, with inconspicuous hair; prothorax with a line of white hair, narrowly interrupted in middle; scutellum and axillæ unarmed, the axillæ with a short broad band of white hair; postscutellum with white hair; metathorax with coarse white hair, including the posterior truncation, the bare plicatulate basal area angulate behind; tegulæ shining testaceous, not enlarged. Wings yellowish hyaline, slightly dusky (but not at all dark) apically; stigma dark reddish, nervures dark brown; basal nervure meeting nervulus; second cubital cell rather broader than high, receiving recurrent nervure not far from end; femora dark brown, anterior and middle tibiæ also dark, but hind tibiæ dull testaceous, with a faint dusky suffusion on outer side; tarsi testaceous; hind femora swollen, long-oval, with a strong tooth beneath near end; hind tibiæ broad, but not much modified. Abdomen without hair-bands, except very weakly on apical segments; venter with a pair of dark spots.

Belgian Congo; Nyangwe (*R. Mayné*), Congo Museum. It is somewhat related to *N. testacea* Friese and *N. latifacies* Strand, but the former has the legs wholly testaceous, and the latter has red antennæ. It also resembles *N. sanguinolenta* Friese, but is easily distinguished by the dull vertex and mesonotum. By the hairy posterior face of metathorax it resembles *N. somalica* Friese. There is also some resemblance to *N. welwitschi* Ckll., which has dark tegulæ.

Nomia cryptodonta, sp. n.

♂.—Length about 11 mm., anterior wing 8·8.

Black, with the depressed hind margins of tergites translucent, middle tibiæ slightly reddish at apex, hind tibiæ broadly pale red apically and reddish along hind margin, tarsi pale red, the small joints of hind ones dusky; mandibles black; head broader than long, the face densely covered with pale, slightly yellowish hair; front and vertex dull; antennæ normal, entirely black; mesonotum and scutellum entirely dull, or the mesonotum may show four shining lines; hair of thorax above thin and short, slightly yellowish; a patch of pure white hair in each axillar region; postscutellum densely covered with white hair, but fulvescent hair just above it on margin of scutellum; area of metathorax angulate posteriorly and with strong cross-ridges; posterior face of metathorax covered with long hair; tegulæ small, very dark. Wings dusky hyaline, yellowish, with the apical part darkened; stigma pale clear red; nervures pale; second cubital cell about square, receiving recurrent nervure not far from end; hind trochanters with a small tooth; hind femora stout, but not to be described as swollen, having a subapical tooth; hind tibiæ rather stout. Abdomen with fine short fulvescent hair, not hiding the surface, which is dull except for the shining pale testaceous apical depressions; just before the depressions are bands of fulvescent hair, strongest on the more apical tergites.

Belgian Congo: Lubumbashi, Katanga, Feb. 8, 1921 (*Michael Bequaert*). Two males. This runs out in all keys to African *Nomia*. Superficially it is similar to *N. dubitans* Ckll., which is more robust, with a much more hairy thorax. The wings suggest *N. fulvipes* Friese, which has quite different legs.

Nomia odontostoma, sp. n.

♀.—Length 11 mm., anterior wing 9.

Not very robust, black, including the short antennæ, but the hind tibiæ are reddish brown with a dusky mark on outer side, the front tarsi are reddish apically, the middle and hind tarsi are light reddish, the hind tarsi dusky apically, above the conspicuous pale fringe; face broad; clypeus finely lineolately sculptured, with a smooth median depression, and at apex with two conspicuous teeth, obliquely directed outward (best seen when looked at from above); face with thin white hair, denser at sides; cheeks with dense pure white hair; front dull; region between upper part of eye and occiput shining; mesonotum and scutellum hardly shining, with thin slightly flavescent hair; sides of thorax with abundant white hair; axillæ with a pure white hair spot;

area of metathorax plicatulate, not very sharply defined; posterior face of metathorax dull; tegulæ very small, convex, shining black. Wings hyaline, the apex broadly dusky; stigma light ferruginous, nervures dusky ferruginous; basal nervure falling a little short of nervulus; second cubital cell very broad, receiving recurrent nervure a little beyond middle; hind tibiæ and basitarsi with long white hair. Abdomen narrowed basally; tergites shining, the first with an oblique patch of white hair on each side, the second with much larger and longer patches, the third and fourth with entire apical bands of white tomentum; the fifth with an apical reddish band; apical plate broad and truncate.

Belgian Congo: Lubumbashi, Katanga, Jan. 12, 1921 (*Michael Bequaert*). In Strand's table this runs to *N. tetraloniformis* Strand, which is smaller, with darker wings. In my tables it runs near *N. tricinata* Friese, which has pale fulvous hair-bands and different tegulæ, and near *N. meridionalis* Friese, which is quite different. The dentate clypeus is distinctive.

Nomia heterura, sp. n.

This certainly appears to be the male of *N. crudalis* Westwood, as I have identified it from Dilolo, but I now think it cannot be the genuine species of Westwood. The first tergite has no pale band such as is shown in Westwood's figure, and the hind femora are broadly red apically. In my key to the *N. tridentata* group (1931) it runs out because the flagellum is dark above, clay-colour beneath; disregarding this, it runs to *N. orientalis* Friese, which has a much broader abdomen and thick coarse hair on hind femora.

♂.—Belgian Congo: Lesse, July 21, 1914 (*J. Bequaert*). Lesse, not far from Lake Albert, is spelled Lese on my map. I present a new table for a number of similar-looking males.

First tergite, seen from above, forming an approximately equilateral triangle......... 1.
First tergite broad, appearing subquadrate .. 2.
1. Wings strongly reddened; black parts of first three tergites dull; tegulæ reddish .... *capensis* Friese.
(Wings not reddened; abdomen shining; tegulæ small and black .... *odontostoma* Ckll., ♀. [only known)

2.	Upper part of black of first tergite polished..	*marana* Ckll.
	Upper part of black of first tergite dull......	3.
3.	Flagellum clay-coloured or light red beneath .	4.
	Flagellum black	5.
4.	Abdomen narrower, with red bands	*heterura* Ckll.
	Abdomen broader, with white bands	*flavitarsis* Friese.
	(The first tergite might be described as triangular, but the very pale tegulæ, and conspicuous band of white hair on margin of first tergite, at once distinguish it from *N. capensis*.)	
5.	First tergite with a broad testaceous apical depression, similar to that on the following tergites	*cryptodonta* Ckll.
	First tergite without such a depression	6.
6.	Abdomen with red bands, the dark parts of second and following tergites with fine grey hair	*heterocera* Ckll.
	Abdomen with pale yellowish or cream-coloured hair-bands	7.
7.	(Hind femora light red, except at base; outer intercubitus with a strong double curve....	*perornata* Ckll., ♀.)
	Hind femora not light red; outer intercubitus not thus curved; hind femora very hairy; hair of thorax above red	*orientalis* Friese (from Kilimandjaro).

Nomia heterocera, sp. n.

♂.—Similar to *N. heterura*; hair of thorax above fox-red; hind femora broadly red at apex, and their tibiæ at base; hind femora not densely hairy; first tergite with a linear red apical band: second and following with pale, slightly yellowish hair, and second to fifth with red bands in the apical depressions. The first tergite is shining, but not polished. The flagellum is long (considerably longer than in *N. heterura*) and entirely black.

Belgian Congo: Walikale, Jan. 13, 1915 (*J. Bequaert*). The hairy tergites (except the first) readily separate this from *N. capensis*. The hair of the face is distinctly yellowish. In both *N. heterura* and *N. heterocera* the basal nervure falls a considerable distance short of the nervulus, which is not the case in *N. orientalis* and *N. capensis*, nor (according to Westwood's figure) in *N. crudelis*.

Nomia marana, sp. n.

♂.—Length about 9·5 mm., anterior wing 8.

Black, with the abdomen largely red; antennæ black, the flagellum very long; tongue very short; orbits converging below; face densely covered with pale flavescent hair, hiding the surface; cheeks with white hair; a shining space next to each lateral ocellus; mesonotum dull and minutely punctured; scutellum bigibbous, the elevations shining; area of metathorax feebly sculptured, but shining; tegulæ not enlarged, black, with a white margin. Wings hyaline, not reddish, faintly dusky at apex; stigma small, dark reddish; nervures brown; basal nervure falling a little short of nervulus; second cubital cell high and narrow, receiving recurrent nervure beyond the middle. Legs mainly black; hind femora greatly swollen, hairy, the underside flattened and shining, pale reddish; on inner side below the femora have two strong teeth; trochanters conical but not spined; hind tibiæ not much enlarged, the hyaline apical lobe rather small. Abdomen with first tergite black, shining, conspicuously punctured, with a red margin; second red with a rather narrow black band; third to fifth black with the depressed apical margins testaceous, the third also red at base and sides: fifth black with a broad pale margin; apex black; basal half of venter red and bare, the apical half densely covered with very long white hair.

Masai Reserve: Mara River, Feb. 10, 1914 (*Capt. A. O. Luckman*). Closely allied to *N. griseohirta* Ckll., from the Orange Free State, but the wings differ, as also do the hind legs. The partly red abdomen is also distinctive. The locality is about eighty miles east of Lake Victoria.

The following records are new:—

N. patellifera Westwood, ♂. Natal: Weenen, Feb. 1925 (*Thomasset*).

N. basutorum Cockerell, ♀. Cape Province: Swellendam, Nov. 1933 (*R. E. Turner*).

N. rodhaini Cockerell, ♀. Belgian Congo: Walikale, Jan. 10, 1915 (*J. Bequaert*).

N. serratula Smith, var. *a*, ♂. N. Rhodesia, ten miles east of Pakaso, Jan. 27, 1911 (*Silverlock*). It differs from Smith's type by the clear red abdomen and broad second cubital cell.

N. rubella jonesi Cockerell, var. *a*, ♂. Natal: Weenen, Feb. 1925 (*Thomasset*). Hind basitarsi black.

N. bicornigera Strand, ♂. Belgian Congo: Uele River (*Rodhain*); Duru (*Rodhain*); Katonsero, July 16, 1914 (*Bequaert*).

N. ablusa Cockerell, ♂. N. Rhodesia: N'Changa (*C. T. Macnamara*, B.M. 1931—179). The specimen is about 10 mm. long, anterior wing 8·5 mm., and the tooth on hind femora is black.

N. wellmani Cockerell, ♀. Belgian Congo: Elizabethville, April 25, 1920 (*Michael Bequaert*). The brief description of *N. katonana* Strand. seems to apply to this species.

N. platycephala Ckll., ♀. Natal: Weenen, Jan.-March, 1927 (*Thomasset*).

Crocisaspidia mackieæ (Cockerell), var. *a*.

♂.—Only the third antennal joint red beneath; tegulæ pale fulvous throughout; scutellar and postscutellar lobes with their apical margins broadly pallid. Wings dilute reddish; abdominal bands white, that on second tergite entire.

Cape Province: Swellendam, Feb. 1932 (*R. E. Turner*). *C. mackieæ* was described as a race of *C. fasciata* (Friese), but it is probably a distinct species. The present specimen comes from the same locality as the female type of *C. confessa* Ckll., but it differs too much from that species to be its male.

Thrinchostoma torridum (Smith).

♀.—Buvumo, June, 1929 (*G. D. H. Carpenter*). British Museum.

Panurginus crenulatus (Cockerell).

This Mexican species. described under *Prosopis* in 1905, belongs to *Panurginus* (s. lat.), a correction which I owe to Mr. P. H. Timberlake, and which has been confirmed by Mr. H. F. Schwarz from an examination of the holotype in the American Museum of Natural History.

XXXIX.—*The Fossil* Acrididæ (*Orth. Salt.*).—Part 1. Catantopinæ. By Frederick E. Zeuner, British Museum (Natural History).

The following survey of the fossil Catantopinæ is the first contribution towards a revision of the fossil Acrididæ, and the second relating to a fossil group of the suborder Acridodea. In the monograph of the 'Fossil Orthoptera Ensifera,' a brief outline of the probable phylogeny of the Acridodea was included (Zeuner, 1939, p. 56). It was pointed out that the Ensifera and the Acridodea can both be traced back to the Palæozoic, and that they are less closely related to one another than had hitherto been supposed. The most primitive families of the Acridodea are the Locustopsidæ and the Elcanidæ. The former, which are the ancestors of the modern Acrididæ and three other families, have recently been revised (Zeuner, 1941, Proc. R. ent. Soc. London, in the press). The Elcanidæ, on the other hand, were, up to 1939, regarded as a subfamily of the Locustopsidæ, but I have found that the body structure is so fundamentally different in the two groups that they must be kept well apart. The Elcanidæ may be the ancestors of two other modern families. This question will be discussed in a later paper , it will suffice in this context to give the divisions of the suborder Acridodea as at present understood by the writer :

Suborder ACRIDODEA.

A Locustopsidæ (Triassic and Jurassic).
Acrididæ (Tertiary and Recent).
Eumastacidæ (Tertiary and Recent).
Tetrigidæ (Tertiary and Recent).
Pneumoridæ (Recent).
B. Elcanidæ (Permian to Jurassic).
Tridactylidæ (Tertiary and Recent).
Cylindrachetidæ (Recent).

Of the modern subfamilies of the Acrididæ, only three are represented with certainty among the fossils, the Catantopinæ, the Œdipodinæ, and the Acridinæ. The Catantopinæ are in many respects the least specialized Acrididæ. They have been recorded from the Oligocene (one species), the Miocene (eight species) and the Pleistocene (three species). The Œdipodinæ, with about seven fossil species, are known from the Miocene only. The Acridinæ, the most highly specialized subfamily, are so far known from the Pleistocene only (about nine species), though they have been claimed to occur in the Miocene (*Tyrbula* Scudder) and are, in fact, likely to have existed at that time. This stratigraphical distribution of the fossils, however, is in all probability accidental, their number still being comparatively very small. No Acridid has been found in deposits of an age earlier than the Tertiary. Though the family must have emerged from the ancestral stock of the Locustopsidæ at the latest during the Cretaceous, it appears that it did not begin to flourish until the Tertiary, probably in connection with the development of open grass-land, which is the favourite habitat of the Acrididæ.

The following signs and abbreviations are used :

*—Fossil specimen(s) studied.
H—Holotype studied.
P—Paratype(s) studied.
C—Cotype(s) studied.
L—Lectotype studied.

Family **Acrididæ.**

Subfamily *CATANTOPINÆ* (=*CYRTACANTHACRINÆ*).

Tribe CATANTOPINI.

Genus PROTOCATANTOPS Zeuner.

1931. *Protocatantops* Zeuner, Fortschr. Geol. Pal. Berlin, (9) xxviii. p. 269.

Genotype.—*Protocatantops gracilis* Zeuner, 1931.

Distribution.—Upper Miocene : Germany.

Remarks. A second species, *P. miocænicus*, had been included provisionally, but certainly belongs to a different genus, and probably even another tribe, the head being much thicker than that of the genotype, and the front almost vertical. After this elimination, *Protocatantops* resembles the Recent *Catantops* Schaum so closely that a revision of the modern genus, which is urgently needed, might prove the identity of the former with one of the groups of the modern genus.

* *Protocatantops gracilis* Zeuner.

H 1931. *Protocatantops gracilis* Zeuner, Fortschr. Geol. Pal. Berlin, (9) xxviii. p. 262, figs. 6, 8 ; pl. 3, figs. 1 *a*, *b*, *c*, 2 *a*, *b*.

* 1931. *Protocatantops gracilis* (?) ♀, Zeuner, Fortschr. Geol. Pal. Berlin, (9) xxviii. pp. 265, 269.

Distribution.—Sarmatian, Upper Miocene : Böttingen, Suabian Alb, Württemberg, Germany.

Holotype.—Württembergische Naturaliensammlung, Stuttgart, Böttingen Coll., no. 2.

Specimen tentatively referred to this species.—Same coll., no. 5.

Parts known.—Head, pronotum, thorax, abdomen, hind legs, probably female only.

Genus MIOCÆNACRIS Zeuner.

1931. ***Miocænacris*** Zeuner, Fortschr. Geol. Pal. Berlin, (9) xxviii, p. 279.

Genotype.—*Miocænacris sœrgeli* Zeuner, 1931.

Distribution.—Upper Miocene : Germany.

Remarks.—This genus has a very large body-size for the Catantopini, but the other characters preserved assign it to this tribe. It appears to be closely allied to *Catantops* Schaum.

**Miocænacris sœrgeli* Zeuner.

H 1931. ***Miocænacris sœrgeli*** Zeuner, Fortschr. Geol. Pal. Berlin, (9) xxviii. p. 275, fig. 9, pl. 5, figs. 1, 2; pl 6, figs. 1 *a*, *b*.

Distribution.—Sarmatian, Upper Miocene : Böttingen, Suabian, Alb, Württemberg, Germany.

Holotype.—Württembergische Naturaliensammlung, Stuttgart, Böttingen Coll., no. 45.

Paratype.—Same coll., no. 44.

Parts known. Head, thorax, pronotum, base of abdomen, hind femur.

Tribe MELANOPLINI.

Genus MELANOPLUS Stal.

1873. ***Melanoplus*** Stål, Recens. Orth. i. p 79.
1910. ***Melanoplus*** Stål, Kirby, Syn. Cat. Orth. iii. p. 509.

Genotype.—*Acrydium femur-rubrum* de Geer, 1773.

Distribution.—Recent : North America and (a few species) Palæarctic region. Pleistocene : Europe.

Remarks.—Some Old-World species of *Podisma* Latr. are now regarded as *Melanoplus* Stål, in particular *Podisma frigida* (Bohem.). The Old-World species of *Podisma* have been revised by Dovnar-Zapolskij (1933, Trud. zool. Inst. Akad. Nauk SSSR, i. pp. 253–268), and also by Ramme (1939, Mitt. zool. Mus. Berlin, xxiv. pp. 138–147). The genotype of *Podisma* is *Gryllus Locusta pedestris* L., and the two species of "*Podisma*" found in the fossil state are generically different from *pedestris* L. In accordance with the practice of Dovnar-Zapolskij and of Ramme respectively, these two species are here provisionally assigned to *Melanoplus* and to *Miramella*.

**Melanoplus frigidus* (Bohem.).

1846. ***Gryllus frigidus*** Boheman, Öfv. Vet.-Akad. Förh. Stockholm, iii. p. 80. (Recent only.)
1910. ***Podisma frigida*** Bohem., Kirby, Syn. Cat. Orth. iii. p. 538. (Recent only.)

* 1933. *Podisma frigida* Bohem., Zeuner, C. R. Acad. polon. Sci. Lett. Cl. math.-nat. 1933, (9) 1 p. (Fossil.)
* 1934. *Podisma frigida* Bohem., Zeuner, Starunia, iii. pp. 10, 11, fig. 8. (Fossil.)

Distribution.—Recent: Alps, northern Europe and Siberia, Altai, Transbaikalia, northern Mongolia, Kamchatka, Alaska. Pleistocene: Starunia, near Stanislawów, Polish Carpathians.

Fossil specimens.—Polish Academy of Sciences, Cracow, Starunia Coll., nos. 8, 12, 13, 14.

Genus MIRAMELLA Dovn.-Zap.

1933. *Miramella* Dovnar-Zapolskij, Trud. zool. Inst. Akad. Nauk SSSR, i. p. 266.

Genotype.—*Podisma solitaria* Ikonnikov, 1911.

Distribution.—Recent: eastern Asia and Europe. Pleistocene: Europe.

Remarks.—Ramme maintains that the European species formerly called *Podisma alpina* (Koll.) has nothing to do with *Melanoplus* (as claimed by Dovnar-Zapolskij), but belongs to the same genus as *solitaria* Ik. I have seen the specimens on which Ramme based his view, and am inclined to agree with him. In my paper (1934, p. 10) the genotype was erroneously called *solistria* Ik. instead of *solitaria* Ik.

**Miramella alpina* (Koll.).

1833. *Gryllus alpinus* Kollar, Beitr. Landeskunde Österr. iii. p. 83. (Recent only.)
1910. *Podisma alpina* Koll., Kirby, Syn. Cat. Orth. iii. p. 538. (Recent only.)
1933. *Melanoplus alpinus* Koll., Dovnar-Zapolskij, Trud. zool. Inst. Akad. Nauk SSSR, i. p. 264. (Recent only.)
*1933. *Podisma alpina* Koll., Zeuner, C. R. Acad. polon. Sci. Lett. Cl. math.-nat. 1933, (9) 1 p. (Fossil.)
*1934. *Podisma alpina* Koll., Zeuner, Starunia, iii. p. 9. (Fossil.)
1939. *Miramella alpina* (Koll.) Ramme, Mitt. zool. Mus. Berlin, xxiv. pp. 139, 143. (Recent only.)

Distribution.—Recent: mountainous districts of continental temperate Europe, from Pyrenees to Carpathians. Pleistocene: Starunia, near Stanislawów, Polish Carpathians.

Fossil specimen.—Polish Academy of Sciences, Cracow, Starunia Coll., no. 15.

Tribe EUPREPOCNEMINI.

* *Euprepocnemini*, gen. indet. *melanosticta* (Charp.).

1831. "Insecte rassemblant un peu à des sauterelles," Boué, J. Géol. iii. p. 105.
1831. *Acridium* Boué, J. Géol. iii. p. 143, pl. 2, fig. 2.

? 1840. *Acridium*, Unger, *Chloris protogæa*, pl. 5. (Figure only, with *Pinus saturni* Unger.)
H 1843. *Œdipoda melanosticta* Charpentier, Verh. Leop.-Carol. Acad. xx. p. 405, pl. 21, figs. 1–5.
1846. *Œdipoda melanosticta* Geinitz, Grundr. Versteinerungskunde, p. 189, pl. 8, figs. 6, 7.
1849. *Œdipoda melanosticta* Charp., Heer, Insektenfauna Œningen Radoboj, ii. p. 15, pl. 2, figs. 1 *a–d*.
1852. *Œdipoda melanosticta* Charp., Giebel, Deutschlands Petref. p. 637.
1856. *Œdipoda melanosticta* Giebel, Fauna Vorwelt, ii. (1) p. 308.
1890. *Œdipoda melanosticta* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 224. ("Perhaps an *Hippiscus*".)
1891. 2403. *Hippiscus melanostictus*, Scudder, Bull. U.S. geol. Surv. lxxi. p. 311.
1891. 2440. *Œdipoda melanosticta*, Scudder, Bull. U.S. geol. Surv. lxxxi. p. 315.
1907 (*Hippiscus*) *melanostictus* Charpentier, Handlirsch, Fossile Insekten, p. 688.
1928. *Scyllina œningensis* Heer ?, Pongrácz, Ann. Mus. nat. hung. Budapest, xxv. p. 143. (*Partim.*)

Distribution. Lower Miocene. Radoboj, Croatia.

Holotype.—Geologische Bundesanstalt, Vienna, no. 73 *a*/*b*, = Charpentier, 1843, pl. 21, fig. 2. (Herewith selected.)

Paratypes.—Charpentier, 1843, pl 21, figs. 1, 3, 4, 5. Not located.

Other specimens.—Geologische Bundesanstalt, Vienna, no. 78. Three specimens on one slab.

Parts known.—Complete specimens with folded wings.

Remarks.—According to Pongrácz (1928), this species is identical with his *Scyllina œningensis*. The holotype of *melanosticta* Charp., however, is smaller than the specimen no. 56 erroneously referred to *Sc. œningensis* by Pongrácz and described by him under the name of *Sc. imperialis* (see below), since its head and pronotum together measure 11 mm., its elytra 30 mm. (compared with 12·5 mm. and 35·5 mm. respectively of *imperialis*).

The holotype of *Œ. melanosticta* has a pronotum reminiscent in shape and pattern of the Recent Euprepocnemini and Calliptamini, and the hind femora have, according to Charpentier, three black spots above and darkened knees. This type of hind leg occurs in many genera, but the pronotum is most characteristic. It is not constricted in the middle, and its outlines are straight. Along, or in place of, the lateral keels there are light-coloured longitudinal stripes. This pattern and shape remind one strongly of the Euprepocnemini, of which this type of pronotum is typical, and to a minor extent of the

Calliptamini and of the genus *Cardenius* (Catantopini). The Catantopini, however, are ruled out by one of three specimens on slab 78. These three specimens all agree, as far as can be made out, with *melanosticta* Charp. in shape and size They are fairly stout. One specimen exhibits a thickened and rounded apex of the abdomen, carrying above two strong and curved cerci like those observed in many Recent Euprepocnemini and Calliptamini. The fossils are, however, somewhat slender for the Calliptamini, especially in the hind femora, and the front is too slanting. In these respects they agree better with the Euprepocnemini (*Chorœdocus capensis* (Thb.) for instance), though in this tribe the hind femora are as a rule longer than in the fossils. The Euprepocnemini and Calliptamini are closely related tribes, the former comprising the forms which prefer damper habitats, whilst the latter tend to prefer a dry environment. In view of their general appearance, the fossils are assigned to the former.

Acridium Boué (1831) is evidently the same specimen which, in 1843, was figured by Charpentier on pl. 21, fig. 5.

* *Euprepocnemini*, gen. indet. *imperialis* (Pongrácz).

* ——. *Œdipoda imperialis* Heer, Label in the coll. of the Geologische Bundesanstalt, Vienna, nos. 56 and 56 *b*.
1928 *Scyllina œningensis* Heer ?, Pongrácz, Ann. Mus. hung. Budapest, xxv. p. 143, figs. 19 *c*, 26, 27 (*Partim.*)
H 1928. *Scyllina imperialis* Pongrácz, Ann. Mus. hung. Budapest, xxv. pp. 143–145.

Distribution.—Lower Miocene : Radoboj, Croatia.

Holotype.—Geologische Bundesanstalt, Vienna, no. 56, with counterpart, 56 *b*.

Specimens tentatively referred to this species.—Hungarian National Museum, Budapest, three specimens (Pongrácz, 1928, pp. 143 and 145).

Parts known.—Complete specimens and wings.

Remarks.—This species is slightly larger than *melanosticta*, the elytra measuring 35·5 mm. and head + pronotum 12·5 mm. Since the difference in the size of the sexes of the species of the Euprepocnemini is usually much greater than that between the specimens of *melanosticta* and *imperialis* respectively, it is likely that these two are distinct species. In shape and pattern of the pronotum they are similar.

Pongrácz regarded *imperialis* as identical with both *Œdipoda melanosticta* Charp. (a view which can be defended) and also with *Œdipoda œningensis* Heer. He assigned his compound species to the American genus *Scyllina* Stål (Acridinæ †).

Œdipoda œningensis Heer, however, is unclassifiable. It has a much more slanting front than the specimens from Radoboj. Heer himself regarded the latter as different from the Œningen species and labelled (but never described) one of them as *Œdipoda imperialis*. This name was legalized by Pongrácz, 1928, in describing in detail the specimen which "von Heer ohne jede Beschreibung mit dem Namen *Œdipoda imperialis* bezeichnet wurde."

Tribe TROPIDACRINI.

Genus TROPIDACRIS Scudder.

1869. *Tropidacris* Scudder, Proc. Boston Soc. nat. Hist. xii. p. 346.
1910. *Tropidacris* Scudder, Kirby, Syn. Cat. Orth. iii. p. 379.

Genotype.—*Gryllus Locusta dux* Drury, 1773.

Distribution.—Recent and sub-Recent : South America.

* *Tropidacris* cf. *latreillei* (Perty).

1832. *Acrydium latreillei* Perty, Del. Anim. Art. p. 123, pl. 24, fig. 4· (Recent only.)
1910. *Tropidacris latreillei* Perty, Kirby, Syn. Cat. Orth. iii. p. 379. (Recent only.)

Distribution.—Recent : South America. Fossil, probably Pleistocene or later ; Trinidad, found enclosed in asphalt.

Fossil specimen.—Exhibition Galleries of the Imperial Institute, South Kensington ; property of the Limmer & Trinidad Asphalt Co., Ltd.

Parts preserved.—Complete female.

Remarks.—The specimen was determined by Dr. B. P. Uvarov. It most probably belongs to *T. latreillei*, but since the specific characters in *Trodidacris* are found chiefly in the coloration, and since the fossil has lost its natural colours, it cannot be assigned to this species without reservation.

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† The whole treatment of the Acrididæ by Pongrácz (1928) proves that he was not aware of the arrangement into subfamilies and tribes of the modern genera. He does not hesitate to regard *Chortoicetes* (Acridinæ) as the primitive venational type of the Œdipodas, and to derive *Calliptamus* (=*Caloptenus*, Catantopinæ), from the Œdipodinæ.

Tribe CYRTACANTHACRINI.

Genus PROSCHISTOCERCA Zeuner.

1937. *Proschistocerca* Zeuner, Proc. R. ent. Soc. London, (B) vi. p. 158.

Genotype.—*Proschistocerca oligocænica* Zeuner, 1937.

Distribution.—Oligocene : England.

* *Proschistocerca oligocænica* Zeuner.

1878. Grasshopper, Woodward, Geol. Mag. (2) v. p. 88.
1879. Two species of Acridiidæ, Woodward, Quart. J. geol. Soc. xxxv. p. 344.
HP 1937. *Proschistocerca oligocænica* Zeuner, Proc. R. ent. Soc. London, (B) vi. p. 158.

Distribution.—Insect Limestone, Bembridge Marls, Middle Oligocene : Gurnard Bay, near Cowes, Isle of Wight, England.

Holotype.—British Museum (Natural History), In.24578. Fore wing.

Paratypes.—Same coll., In.17339, In.24587, I.8799, In.25728, I.8633, In.20527, In.24782, In.17342 (parts of fore wings), and In.17406, In.17407 (parts of hind wings).

Further specimens referable to this species.—Same coll., In.17346, In.24781, In.24777, I.8877, In.17350 (parts of fore wings, the last specimen somewhat smaller than the others, possibly a different species), In.10283 (part of hind wing), In.24783 (fragments of fore and hind wings and of body).

Parts known.—Fore and hind wings.

Remarks.—The two specimens mentioned by Woodward (1878, 1879) were in the A'Court Smith Collection, which since has been incorporated in the British Museum Collection. There is little doubt, therefore, that his specimens are among those on which the description was based.

Tribe uncertain.

Genus HEERACRIS Zeuner.

1937. *Heeracris* Zeuner, Proc. R. ent. Soc. London, (B) vi. p. 159.

Genotype.—*Acridium œningense* Scudder, 1895.

Distribution.—Miocene : Germany.

Heeracris œningensis (Scudder).

1895. *Acridium œningense* Scudder, Geol. Mag. (4) ii. p. 118, pl. 6, fig. 2.
1907. (*Acridium*) *œningense* Scudder, Handlirsch, Fossile Insekten, p. 688.
1937. *Heeracris œningensis* (Scudder) Zeuner, Proc. R. ent. Soc. London, (B) vi. p. 159.

Distribution. Sarmatian, Upper Miocene: Œningen, near Lake Constance, Baden, Germany.

Holotype.—Lacoe Coll., Pittston, Penn., U.S.A., no. 6844.

Parts known.—Apical two-thirds of fore wing.

Remarks.—About 51 mm. long (36 mm. preserved), 8 mm. wide. Apex rounded. *Rs* well developed, with nine terminal branches. *M* with four branches, according to the drawing. *M* and *CuA* not connected; discoidal cell, therefore, open. *CuA* very peculiar, with five terminal branches directed toward the apical part of the hind margin, the second and third forming a subsidiary fork, according to the figure. Scudder speaks of the "lower branch of the upper fork" being branched again, but the figure shows no upper fork. The first branch of *CuA* is strongly bent upwards near its base, as is often observed in forms with a closed cell. This would suggest that the cell is actually a closed one and that the basal portion of the closing branch of *M* has become obliterated. In such cases, which do occur in Recent forms, however, the median branch is again separated from the first cubital branch more distally, but in the fossil there is merely one simple vein.

The complicated structure of *CuA* appears to be very characteristic of this fossil form, and is not found in any known genus of modern Acrididæ. All other characters remind one of the Catantopinæ, or possibly Œdipodinæ, but the absence of a discoidal vein excludes the latter subfamily.

Scudder felt quite certain that this fossil is an "*Acridium*." This "genus" of the Catantopinæ is now divided into a number of distinct genera, all of which have more slender fore wings than the fossil, with narrower apical portions. I have studied all the Recent Acridid genera with a similar shape and venation, represented in the collection of the British Museum. Only a few Catantopinæ have a similar *CuA*, as, for example, *Tropidacris*, in so far as there is a second branch, beside the first, which is forked as usual. This second branch, however, runs into, and is fused with, the lower branch of the fork. No genus is known with three or more branches directed apically. Although it is impossible to decide to which tribe the fossil belongs, it is sufficiently well characterized to bear its own name.

Genus TÆNIOPODITES Cockerell.

1909. *Tæniopodites* Cockerell, Amer. J. Sci. (4), xxviii. p. 283.

Genotype.—*Tæniopodites pardalis* Cockerell, 1909.

Distribution.- Miocene : Colorado.

* *Tæniopodites pardalis* Cockerell.

H 1909. *Tæniopodites pardalis* Cockerell, Amer. J. Sci. (4) xxviii. p. 283, fig. 1

Distribution.—Miocene : Station 13 B, Florissant, Colorado.

Holotype. University of Colorado Museum. Counterpart · British Museum (Natural History), In.19228.

Parts known.—Fore wing.

Remarks.—Only the fore portion of the wing is preserved, the anal area being lost along the clavus fold. Elytron comparatively broad in shape, fore margin only slightly curved, apex apparently well rounded. Spots not in every interspace, numerous, but scattered over the wing.

The erection of a genus for this fossil was justified, since it is unlike any known Recent genus in the pattern. It is reminiscent, however, of certain genera of the Catantopinæ. Cockerell compared it with *Tæniopoda* Stål, whilst A N. Caudell, who saw a photograph of the specimen, noted a resemblance to *Tropidacris* Scudder, *Goniopoda* Stål, and *Diponthus* Stål. Unfortunately, the venation is badly preserved and cannot be used in the determination, though Cockerell was able to make out one important character : the *C* (his first subcostal) does not lie between two rows of spots but cuts at least through several of them. This character, however, excludes all the mentioned genera simultaneously. Furthermore, the egg-shape of the elytron of *Tæniopoda* is unlike that of the fossil, and the species of *Tropidacris* are far too large. The Recent genus which the fossil resembles most, at least superficially, is perhaps *Diponthus*, but here, again, the *C* does not cut any spots, and the spots are arranged in the nervular interspaces, thus covering densely the whole wing. At least some of the spots of *Tæniopodites must* lie on veins. This appears to be an essential difference.

The pattern of *Tæniopodites* reminds me rather of certain Old-World Catantopinæ (all the above-mentioned genera are American). There are some species of the *Thisoicetrus* group (Euprepocnemini) which have essentially the same kind of pattern, though, of course, it is easy to find differences of degree in the development of the maculation. Such species are *Heteracris speciosa* Sj. (South Africa), *Thisoicetrus adspersus* Redt. (West Asia), and *Parazelum nigripes* Sj. (Australia). In these species small spots are scattered over the fore wing, some of them are crossed by veins, no portion of the wing is particularly rich in spots (apart from the darkened apex in *Heteracris speciosa*), and no tendency to form cross-bands is recognizable. Though, as a rule, the elytron is more slender than in the fossil species, its shape is extremely similar in the *Heteracris* mentioned, especially in the male. *Tæniopodites pardalis* Cock., therefore, is likely to belong to the *Thisoicetrus* group of the Euprepocnemini or, less probably, to some other related group. It is even less probable that it belongs to a subfamily of the Acrididæ other than the Catantopinæ. The only one that might be taken into consideration is the Pyrgomorphinæ. *Scutillya verrucosa* Sj. (Western Austsalia) has a maculation recalling that of the fossil, but the spots are denser and partly fused to vertical bands, and the shape of the wing is different.

* *Catantopinæ*, gen. indet. *miocænicus* (Zeuner).

H 1931. *Protocatantops miocænicus* Zeuner, Fortschr. Geol. Pal. Berlin, (9) xxviii. pp. 265, 270, 272, fig. 7, pl. 4, figs. 1 *a*, *b*.

* 1931. *Protocatantops miocænicus* (?) Zeuner, Fortschr. Geol. Pal. Berlin, (9) xxviii. pp. 273, 265.

Distribution.—Sarmatian, Upper Miocene: Böttingen, Suabian Alb, Württemberg, Germany.

Holotype.—Württembergische Naturaliensammlung, Stuttgart, Böttingen Coll. no. 3.

Specimen tentatively referred to this species.—Same coll., no. 4.

Parts known.—Female with closed wings.

Remarks.—In the original description this species was provisionally assigned to *Protocatantops* (*q.v.*), in spite of the considerably thicker head, with its facial angle of almost 90° and its stouter thorax. It cannot be congeneric with *Protocatantops gracilis*, the genotype, and it is advisable, therefore, to leave its generic relationship undecided for the time being. The head of *miocænicus* reminds one of the Calliptamini. The pronotum has no lateral carinæ. The prosternal spine is present, so that it unquestionably belongs to the Catantopinæ, but the tribe cannot be ascertained on the evidence afforded by the holotype.

* *Catantopinæ*, gen. et sp. indet. (Zeuner).

* 1931. *Protocatantops* sp. ? Zeuner, Fortschr. Geol. Pal. Berlin, (9) xxviii. p. 275.

Distribution.—Sarmatian, Upper Miocene: Böttingen, Suabian Alb, Württemberg, Germany.

Specimen.—Württembergische Naturaliensammlung, Stuttgart, Böttingen Coll., no. 6.

Parts known.—Part of head, thorax and abdomen.

XL.—*Some Remarks on the Genus* Helleria *v. Ebner* (*Terrestrial Isopoda*). By Walter E. Collinge, D.Sc.

[Plates VI. & VII.]

I. INTRODUCTION.

Some years ago Miss Phyllis K. Wade very kindly forwarded to me for identification two species of Terrestrial Isopoda collected by her under stones near Cannes.

Upon examination, I was pleasantly surprised to find three fine examples of *Helleria brevicornis* v. Ebner. Upon comparing these with von Ebner's description and figures (6), I soon discovered a number of discrepancies and omissions. At first I thought that possibly these specimens belonged to a new species, but a more careful examination did not support this supposition.

As the genus is of more than usual interest, I here give some further structural details and figures, particularly of those overlooked by von Ebner.

II. HISTORICAL.

The genus *Helleria* was described by von Ebner (6) early in 1868, for the reception of a species of Terrestrial Isopod obtained in 1855 near Ajaccio in the island of Corsica, to which he gave the specific name *brevicornis*.

Von Ebner described this species in considerable detail and discussed at some length the systematic position and affinities of the genus, to which reference will be made later.

In 1879 Budde-Lund (1) pointed out that the generic name was preoccupied and suggested that of *Syspastus*, and placed the genus in a separate family, Syspasti.

In 1882 A. Costa *, to whom von Ebner's and Budde-Lund's writings were then unknown, described the species under the name of *Syntomogaster dasypus*, and in the following year, finding that the generic name was preoccupied for a Dipteron, he suggested *Syngastros*.

Eaton (5), in 1882, pointed out that the name *Helleria* must remain for this genus, as the *Helleria* Norman, a genus of Gammaridæ, dated only from December, 1868, and *Helleria* Czeony, a genus of the Ægidæ, was not named until 1870.

In 1891 (8) Hilgendorf described the presence of antennulæ in this species, which were stated by von Ebner to be entirely absent.

Stebbing (11), in 1893, substituted the name Helleriidæ for that of Syspasti.

Nobili (10), in 1905, also pointed out that von Ebner's generic name had priority.

Von Ebner (7), in 1907, gave some further details after examining a large number of specimens obtained at Cannes. He notes that all the examples were males and in different stages of life. The animals lay peacefully rolled up on the damp earth. In the young specimens the mestasomatic segments are entirely fused. On the smallest specimens he noted two rows of humps along the mid-dorsal line, which later disappear. The colour, he states, is very variable, and the animals have a slow gait and walk almost equally well backwards as forwards and sometimes sideways.

III. *Helleria brevicornis* von Ebner. (Pls. VI. & VII. figs. 1–9.)

Helleria brevicornis v. Ebner, Verhandl. d. k.k. zool. bot. Ges. Wien, 1868, xviii. p. 96, t. i., f. 1–15.

Syspastus brevicornis Budde-Lund, Pros. gen. spec. Crust. Isop. Terr. 1879; Eaton, Ann. & Mag. Nat. Hist. 1882 (ser. 5), x. p. 458.

Syntomogaster dasypus Costa, Rendic. dell. Acc. d. scienze ecc., Napoli, 1882, xxi.; Atti. d. Akad. 1883 (s. ii.), 1.

Helleria brevicornis Hilgendorf, SB. Ges. nat. Freunde, Berlin, 1891, p. 181.

Helleria brevicornis Stebbing, Hist. Crust. 1893, p. 425.

Body broad, elliptical, strongly arched; surface almost smooth and very finely punctured. Cephalon (Pl. VI. figs. 1 & 2) nearly twice as wide as long, medianally there is a well-marked frontal margin formed by the

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* Rend. d. Accad. d. Sci. Napoli, 1882, Ann. 21.

dorsal border of the epistome, lateral lobes well developed and separated from the frontal margin by a wide indentation. Dorsal surface produced into two slightly convex areas, with a transverse indentation posteriorly ; epistome having the form of a triangular plate, slightly concave at the apex, convex above and with reflected dorsal margin, whole of surface with minute spinous processes.

Eyes medium sized, situated behind the anterior half of the cephalon and dorso-laterally.

Antennulæ very small, rudimentary (?)

Antennæ (Pl. VI. fig. 3) short, the first three joints almost cubical, the fourth and fifth elongated and widening slightly at their distal ends ; flagellum two-jointed, the distal joint being very small and nodular with a series of terminal setæ. Von Ebner states that the antennæ are 8-jointed, superficially appearing 6-jointed, the sixth joint bearing two very short joints which form a cone-shaped tip. As stated above, there are five joints in the antennæ proper and two in the flagellum. I think von Ebner mistook the cluster of terminal setæ for a joint. In his figures of the cephalon (*op. cit.*, figs. 2 & 3) he shows the flagellum correctly.

First maxillæ (Pl. VI. fig. 4) with strong outer lobe bearing distally three stout tooth-like spines, then one small and one large one, and on the inner side five small spines ; the inner lobe distally bears three stout setose spines on its inner side. Maxillipede (Pl. VII. fig. 5) with three-jointed outer palp and single-jointed inner palp. The first joint of the outer palp is very short and carries two small spines on its outer surface, the second joint is comparatively large and has two setose spines on its inner distal border, the third joint, which articulates with the second on the outer distal border, is cone-shaped with terminal setæ. The inner palp terminally is truncate and has three small tooth-like spines.

Mesosome (Pl. VII. fig. 6) strongly arched, the first segment is considerably longer than the rest with large pleural plates, the posterior angle of which project backwards. The remaining segments 2–7 have the pleural plates strongly marked off from the mesosome by a deep groove. The terminal margin of the second is truncate, that of 3–6 somewhat bluntly pointed and the seventh again truncate. Appendages of the mesosome (Pl. VII. fig. 7) comparatively short, distal joints strongly spinous, terminating in a strong claw.

Metasome consisting of five fused segments forming a strongly-arched shield. Two pairs of short lateral sutures mark off the third from the fourth and the fourth from the fifth segments. Telson very small. Uropoda (Pl. VII. figs. 8, 9), basiopodite with straight anterior and interior borders, outer border curved inwards to the base with slight extension at the anterior outer border; exopodite articulating on the posterior inner side of the basiopodite. It consists of three joints, the terminal one bearing a long curved spine, all densely setose.

Length 24 mm., breadth 12·5mm., height (approx.) 5mm.

IV. AFFINITIES AND SYSTEMATIC POSITION.

In so far as we are aware this is the only Terrestrial Isopod which has the appendages of the uropoda jointed, separates viz., the exopodite into three joints, a character which it from all other members of the order Oniscoidea.

It may, perhaps, be questioned whether the small spinous-jointed appendage is homologous with the exopodite of the basal plate of the uropod. One has, however, but to compare it with the condition which obtains in the Idoteidæ to be convinced. In this latter family we have a large number of genera all characterized by the more or less complete fusion of the metasomatic segments, and, as I have elsewhere (4) pointed out, such a change has forced the otherwise lateral uropods to rotate to the underside.

Von Ebner placed this genus in the family Tylinen and compared it in detail with the *Tylos latreillei* (Aud.). He admits that the cephalic characters of the two genera are very unlike one another.

With von Ebner's view that *Helleria* is related to *Tylos* I cannot, for a moment, agree. The form and structure of the cephalon, mouth parts, meso- and metasomatic segments, and the uropoda are entirely distinct and widely separated from one another in these two genera. Von Ebner has strained any superficial resemblances that may exist in his comparison, which is as unconvincing as it is incorrect. In a like manner I must dissent from his view that the Ligiidæ are in any way related to the Armadillidæ or to either *Tylos* or *Helleria*. The comparison he institutes of the appendages of the mesosome and metasome in these two latter genera might be equally well employed in comparing *Helleria* with any other genus of Terrestrial Isopods.

At present the genus *Helleria*, in my opinion, stands by itself, and only through the discovery of some intermediate type will its rightful place be found.

V. GEOGRAPHICAL DISTRIBUTION.

Our knowledge of the distribution of this interesting genus is at present very imperfect. Originally found in the Island of Corsica, and later Sardinia, Elba and Pianosa, it was later found to occur in the French Riviera from Antibes to St. Maxime. It has also been recorded from Genoa (Italy).

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EXPLANATION OF PLATES VI. & VII.

PLATE VI.

Helleria brevicornis v. Ebner.

Fig. 1. Dorsal view of the cephalon.
Fig. 2. Anterior view of the cephalon.
Fig. 3. Antenna.
Fig. 4. Terminal portions of the inner and outer lobes of the first maxilla.

PLATE VII.

Helleria brevicornis v. Ebner.

Fig. 5. Terminal portion of the maxillipede.
Fig. 6. Dorsal view of the pleural plates of the mesosomatic segments.
Fig. 7. Ventral view of the third mesosomatic appendage.
Fig. 8. Right uropod, dorsal view.
Fig. 9. Much enlarged figure of the exopodite of the uropod.

XLI.—*Descriptions and Records of Bees.*—CLXXXIII.

By T. D. A. Cockerell, University of Colorado.

Halictus montagui, sp. n.

♀. Length about 10·5 mm., anterior wing 7·4.

Black, including legs, except that the tarsi are red at end; hair of head and thorax white, scanty; head broad; mandibles black, very faintly brownish at apex; clypeus polished, with well separated large punctures; supraclypeal area also polished and punctured; front dull, with a shining line along orbits; vertex dull; flagellum dusky reddish beneath; mesonotum and scutellum highly polished, with well separated punctures; postscutellum large, dull, the surface not hidden by tomentum; area of metathorax large, dull, with a granular surface, but shining hind margin; hind spur with short spines, in style of *H. mesopolitus* Ckll. and *H. leucophenax* Ckll.; hind basitarsi broad; tegulæ very dark reddish, with white hair in front Wings reddish fuliginous; stigma large, dusky red; nervures light brown, basal nervure dark, second cubital cell higher than broad, shorter than third on marginal, receiving recurrent nervure near end. Abdomen dullish, shining basally, with no basal hair-bands, but the tergites with apical bands of pure white hair, failing in middle, but entire and broad on fourth; apex with pale fulvescent hair; venter with copious long white hair.

Cape Province: Montagu, Oct. 1–21, 1924 (*R. E. Turner*). The locality is 750 ft. alt.

Nearest to *H. communis* Smith, but distinguished by the black abdomen with white hair-bands. There is apparently close affinity with the smaller *H. marginatus* Brullé, of Europe. There is a superficial resemblance to *H. prominens* Ckll., on account of the dark wings.

Halictus pastinops, sp. n.

♀.—Length about 5 mm., anterior wing 4.

Black, with the legs somewhat brownish, the tarsi rather pale brown; mandibles pale yellow in middle, red at apex; hair of head and thorax dull white, thin, with no band at hind border of mesonotum; head broad, subquadrate; clypeus shining, but supraclypeal area dull; front, sides of face and vertex shining; flagellum dusky reddish beneath; mesonotum shining but not polished, with a strong median groove; scutellum shining, not at all bigibbous; area of metathorax very large, appearing dull and granular under a lens, the hind margin narrowly shining; tegulæ pale testaceous Wings hyaline, stigma reddish brown, nervures very pale; second cubital cell nearly square, but outer side oblique, the recurrent nervure is received at apical corner; third cubital cell broad, but not produced apically; hind tibiæ with conspicuous pure white hair Abdomen shining, the margins of the tergites pallid, no basal bands or patches of hair: apex with dull white hair. Microscopic characters: scape hairy, the hairs short and silvery; area of metathorax densely very minutely pitted, forming a sort of minute reticulation; hind spur with two long spines and a short tooth (style of *H umtaliellus* Ckll. and *H. diminutellus* Ckll.).

S. Rhodesia: Matopo Hills, April 17–30, 1932 (*J. Ogilvie*). Also collected in the same locality by C. P. Harvey and Alice Mackie.

Closely allied to *H. pastinimimus* Ckll, which has dark tegulæ, more shining mesonotum, and a narrower face.

Halictus reenenicus, sp. n

♀.—Length about 11·4 mm., anterior wing 8·5.

Black, including legs and antennæ; hair of thorax above abundant, fulvous, of sides of face and front dull whitish; clypeus and supraclypeal area moderately shining, clypeus with a median groove; front dull, but shining just below ocelli; vertex shining; mesonotum entirely dull, but scutellum shining; area of metathorax large, poorly defined, granular, not plicate; tegulæ shining dark rufous. Wings hyaline, stigma rather small, clear ferruginous; nervures pale ferruginous; second cubital cell large, square; first recurrent nervure meeting second intercubitus; outer recurrent and intercubitus weakened. Legs with pale fulvescent hair. Abdomen broad, shining, finely punctured, the tergites without apical bands, but second to fourth with pure white bands at extreme base, largely concealed; apex with black or greyish-black hair; venter with short stiff slightly yellowish hair. The hind spur is of the same type as that of *H. deceptus* Smith. The hind basitarsus is a little longer than the other joints together, with a copper-red fringe at end.

Natal: Van Reenen, Drakensberg, 5500 to 6500 ft., Oct. 1926 (*R. E. Turner*)

This is a large species with a superficial resemblance to *H. perihirtus* Ckll., but with an entirely different abdomen. It is really allied to *H. deceptus* Smith and *H. matoporum* Ckll., both of which are smaller and have the mesonotum moderately shining

Halictus weenenicus Cockerell.

When recently describing this species, I failed to note its close affinity with *H. retigerus* Ckll., from which it differs in having the thin pale hair of the abdomen on the third and following tergites (instead of beginning on the fourth) and the second and third tergites with cuneiform white basal marks on each side It also differs by the black tegulæ I cannot avoid the suspicion that this may be *H. rugicollis* Friese, described from Zululand, but if so, this can only be proved by comparison of specimens. The long white hair on abdomen beneath, mentioned by Friese, is equally apparent in *H. weenenicus*.

Halictus (*Oxyhalictus*) *atopterus* Cockerell.

♂.—Length 9·5 mm., anterior wing 7·5

Black, including antennæ and legs except that tarsi are red at apex; clypeus strongly produced, entirely black, dull, with fine close punctures, the labrum appears as a broad extension of the clypeus, at a lower level, more or less shining and irregularly ribbed, and below this is the large rounded process, fringed with long hairs which have a coppery tint The hair of the thorax above varies from strongly reddish to dull whitish. The subapical lateral spines of abdomen are small and obtuse

Natal: Weenen (*H. P. Thomasset*)

Halictus milneri, sp. n.

♂.—Length about 10 mm., anterior wing 7.

Black, including face, antennæ and legs, only the tarsi reddened at apex; hair of thorax pale fulvous, redder above, of head dull whitish with a slight fulvous tint; head rather broad; mandibles broadly dark red apically; labrum polished; clypeus dullish, with a very strong median groove, and an oblique ridge on each side defining a broad triangular median area; front and vertex dull; antennæ long, but not excessively so, the flagellar joints strongly moniliform; mesonotum dull, scutellum faintly shining; area of metathorax plicate; tegulæ black. Wings hyaline; stigma rather small, pale fulvous with a darker margin; nervures brown; second cubital cell large and square, receiving recurrent nervure near end; third cubital hardly broader on marginal than second. Abdomen shining, deeply incised at bases of second and third tergites; margins of tergites dark, not banded, bands of greyish tomentum, broad at sides, failing in middle, at bases of second and third tergites; sixth sternite emarginate; seen from behind, the subapical sternites show very slender shining silvery bands.

Cape Town: Milnerton, Jan. 1926 (*R. E. Turner*).

I cannot associate this with any known female, but the antennæ recall those of male *H. mirandicornis* Ckll., which has linear tegumentary bands on abdomen. Perhaps the nearest relative to *H. semidiversus* Ckll., from Ceres, which has strongly dusky wings.

Halictus trianguliferus, sp. n.

♂. Length about or rather over 5 mm., anterior wing 4·3.

Black, the clypeus with an apical pale yellow band, with a pointed extension upward in middle; knees (the front pair broadly), tibiæ and tarsi pale yellow suffused with reddish, but hind tibiæ black, with a yellow stripe posteriorly; pubsecence scanty, white, slightly yellowish on face, a band of pure white hair along hind border of mesonotum; mesopleura broadly bordered with white tomentum, leaving a triangular black (exposed) area in middle; abdominal tergites with rather narrow entire basal hair-bands, the first tergite with a large triangular patch on each side of basal part; face hairy; scape with a light stripe; flagellum dusky reddish beneath; mesonotum and scutellum dull; postscutellum large, not covered with hair; area of metathorax large, appearing granular under a lens, the apical part moderately shining; under the microscope it is seen that the basal two-thirds of the area is covered with minute irregular plicæ, while the apical part shows an excessively fine lineolation; tegulæ pale testaceous.

Wings hyaline, stigma pallid, with a dark margin, nervures very pale; second cubital cell higher than broad, receiving recurrent nervure a short distance from end; third cubital not produced apically. Abdomen moderately shining.

S. Rhodesia: Matopo Hills, May 1, 1932 (*C. P. Harvey*).

This resembles *H. collegus* Cam., which is probably the male of *H. dunbrodyensis* Cam., but differs in the legs and the colour of the tegulæ. The area of metathorax also differs. In many ways it is like *H. perileucus* Ckll. and Ireland but that lacks the large patches of hair at sides of first tergite; it is, however, closely allied. The very pale stigma separates it from such species as *H. parapastinus* Ckll.

Halictus holomelanurus, sp. n.

♀. Length about 6 mm., anterior wing 5.

Black, rather robust, with short broad abdomen; pubescence dull white, scanty, conspicuous at sides of face; head broad, but face narrowed below; clypeus moderately shining, but coarsely punctured; supraclypeal area not polished; a shining line on each side next to clypeal margin; front dull; vertex shining; flagellum obscurely brownish beneath; mesonotum somewhat shining, but not at all polished, distinctly punctured (the microscope shows punctures running in rows, on a minutely lineolate or tessellate surface); scutellum shining on disc, slightly bigibbous; area of metathorax large, dull, rugose, with no shining margin (the microscope shows coarse irregular anastomosing plicæ, covering the surface); posterior truncation sharply defined all round; tegulæ very dark, almost black, punctured around the margin. Wings hyaline; stigma dusky, rather pale reddish; nervures very pale; second cubital cell quadrate a little narrowed above, receiving recurrent nervure a short distance from end; outer nervures weakened. Legs black, the tarsi reddish at apex; hind basitarsi long and slender, with a large copper-red brush; hind spur with two broad rounded teeth about the middle (style of *H. prominens* Ckll. and *H. pellitosus* Ckll.). Abdomen shining, intense black, without bands or spots; venter strongly punctured, and with thin white hair, conspicuous in side view, on fourth and fifth sternites, this hair is not long or curled.

S. Rhodesia: Matopo Hills, April 17–30, 1932 (*J. Ogilvie*).

From this species, *H. pastinus* Ckll. is easily known by the polished mesonotum; *H. calviniensis* Ckll. by the pale margins of tergites; *H. perfumidus* Ckll. by the broad head and dark wings; *H. hirtulinus* Ckll. by the much smaller, shining mesonotum.

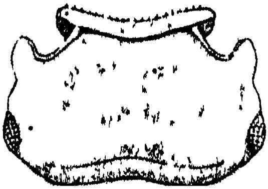
Halictus subterminalis, sp. n.

♀.—Length about 6 mm., anterior wing 5·3.

Black, rather robust, with broad abdomen; hair of head and thorax dull white, abundant on cheeks and sides of thorax; head broad, but orbits converging below; clypeus and supraclypeal area polished; front weakly shining, punctured, appearing densely rugosopunctate under microscope, with many plumose hairs; vertex shining; flagellum very obscurely reddish beneath; mesonotum moderately shining, not at all polished, the miscrocope shows very dense minute punctures on a lineolate surface; scutellum dullish, somewhat bigibbous; postscutellum with dense tomentum; area of metathorax large, entirely dull, with no shining margin, the microscope shows an excessively delicate reticulation, and some cross-lines apically; tegulæ pale reddish. Wings hyaline; stigma very pale yellowish, the margin not dark; nervures almost colourless; second cubital cell small, contracted above, receiving recurrent nervure some distance from margin; third cubital cell produced apically. Legs black, or slightly brownish, the small joints of tarsi pale reddish; hind spur with a single obtuse tooth about the middle, in the style of *H. michaelseni* Friese and *H. subvittatus* Ckll. Abdomen dull, the first tergite moderately shining, hind margins of tergites more or less rufescent, broadly and conspicuously so on second; first tergite with a broadly interrupted hair-band about middle; second with a narrow but entire basal band; third with a broad basal band; fourth with a linear basal band, mostly concealed; apical part of abdomen with reddish hair.

S. Rhodesia: Matopo Hills, May 1, 1932 (*C. P. Harvey*).

Allied to *H. terminalis* Smith, but distinguished by the black tibiæ and basitarsi, and the characters of the abdomen. Also allied to *H. michaelseni* Friese, but much less robust and with narrower face.



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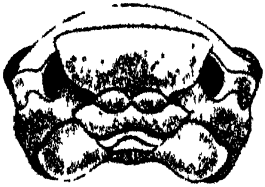

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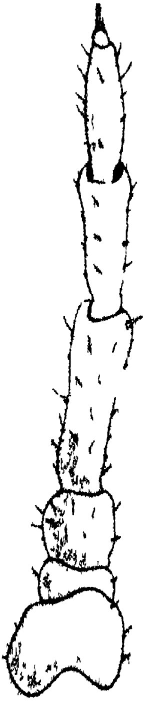

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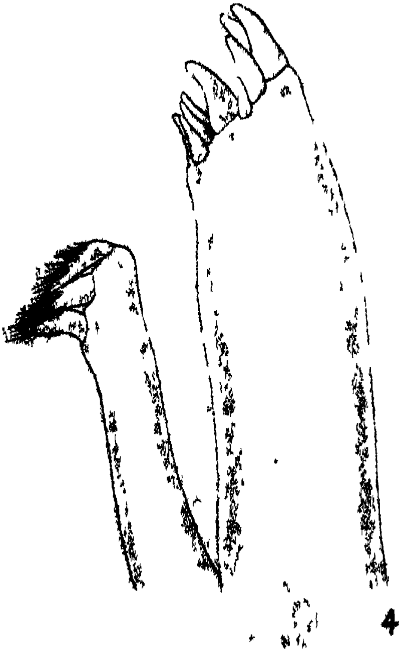

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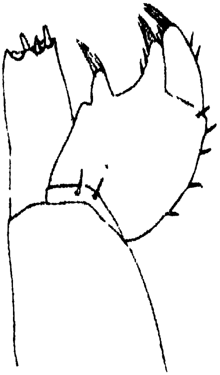
Helleria brevicornis v. Ebner



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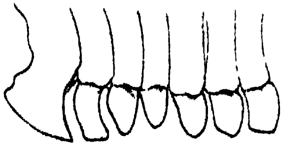

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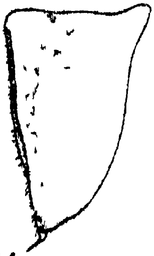

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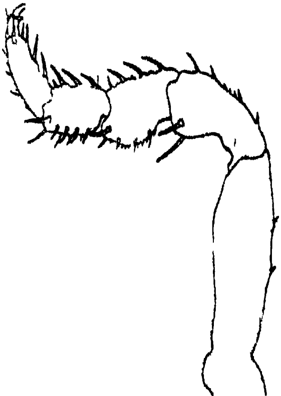

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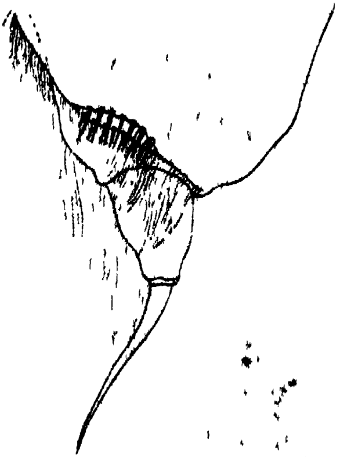

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L. J. J. del. ad nat

Helleria brevicornis v. Ebner.

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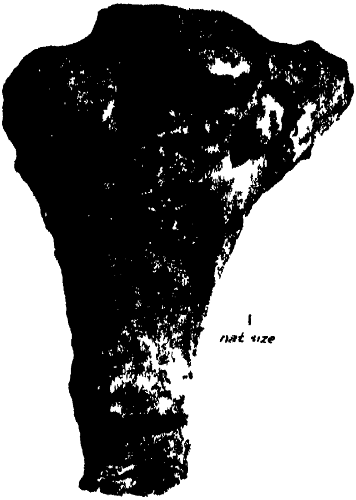

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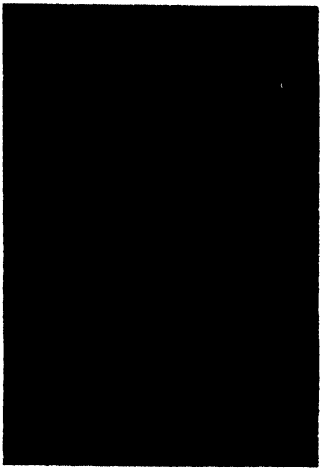

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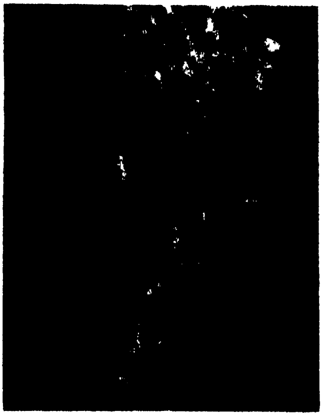

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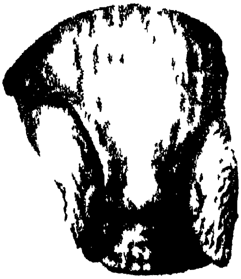

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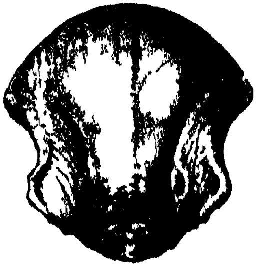

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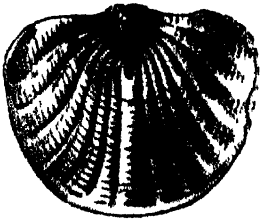

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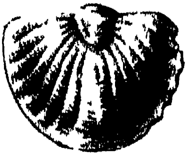

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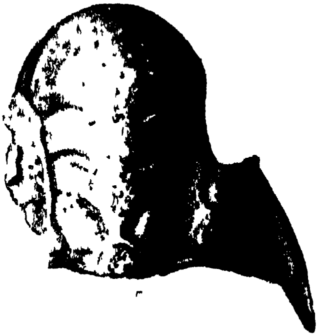

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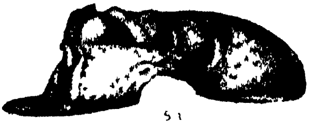

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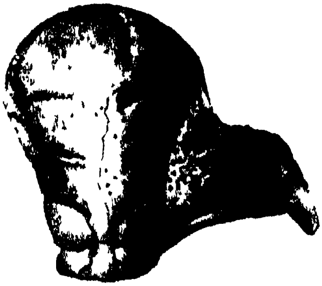

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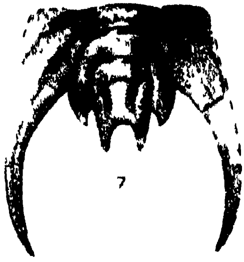

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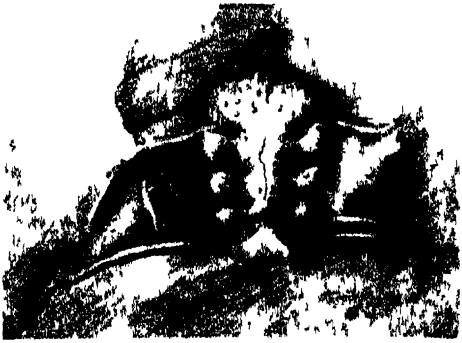

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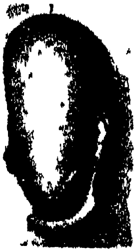

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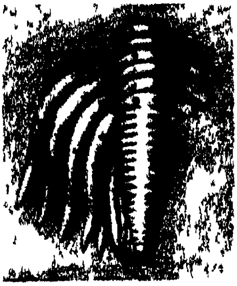

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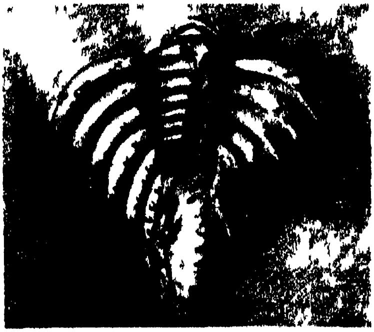

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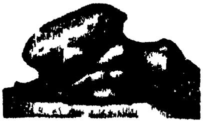

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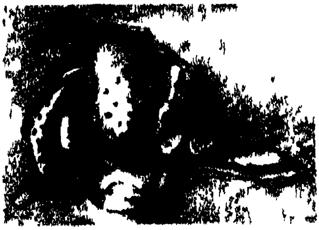

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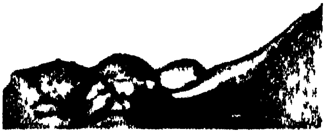

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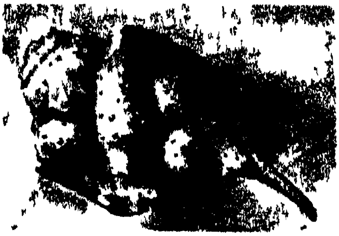

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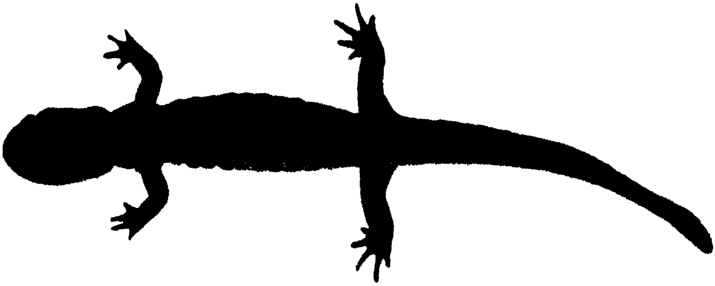

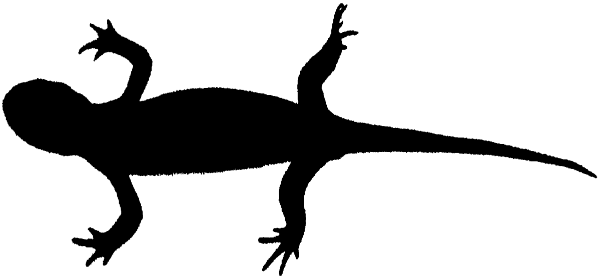

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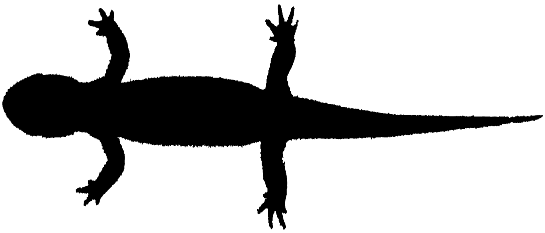

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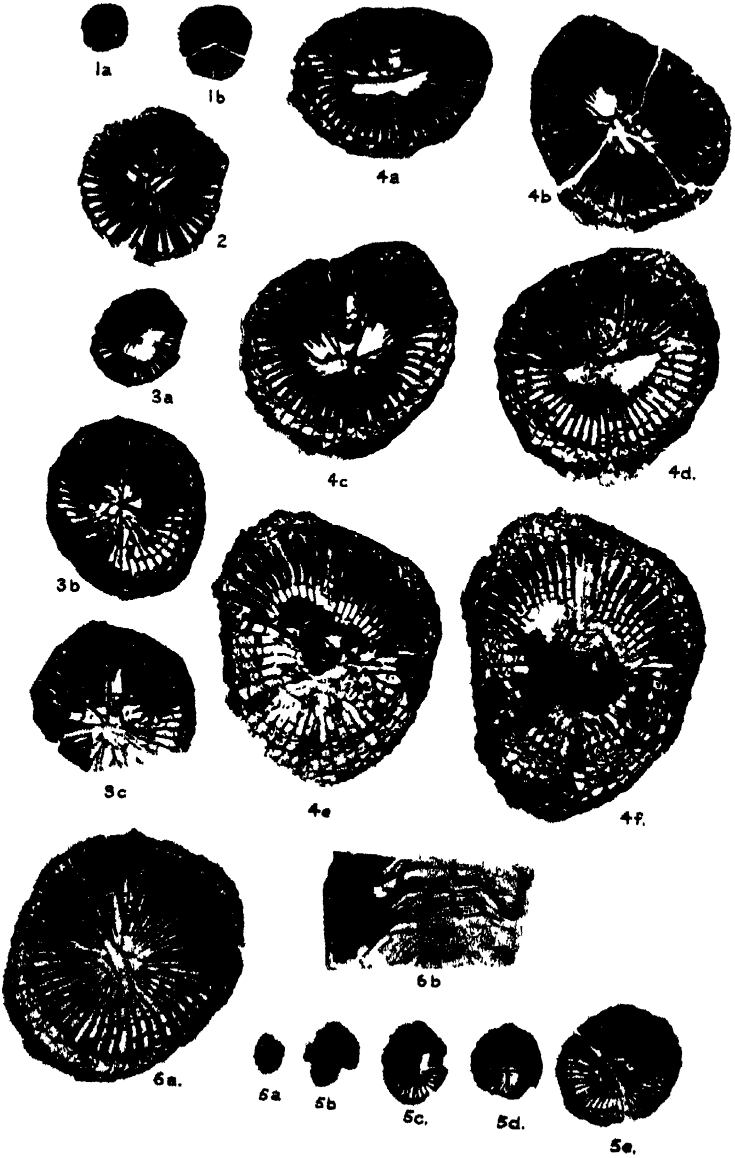

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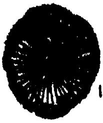
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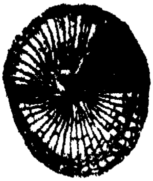
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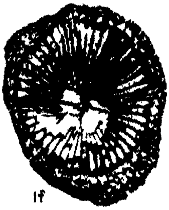
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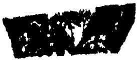
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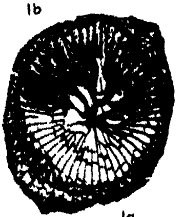
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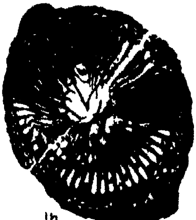
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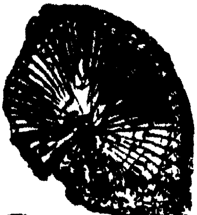
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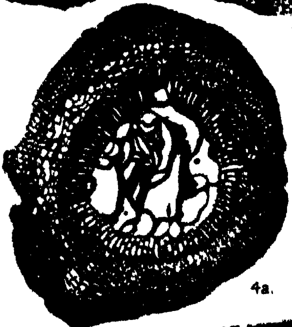
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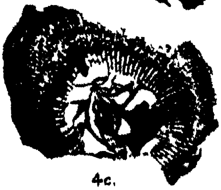
4c.

P. LONGISEPTA sp. nov.
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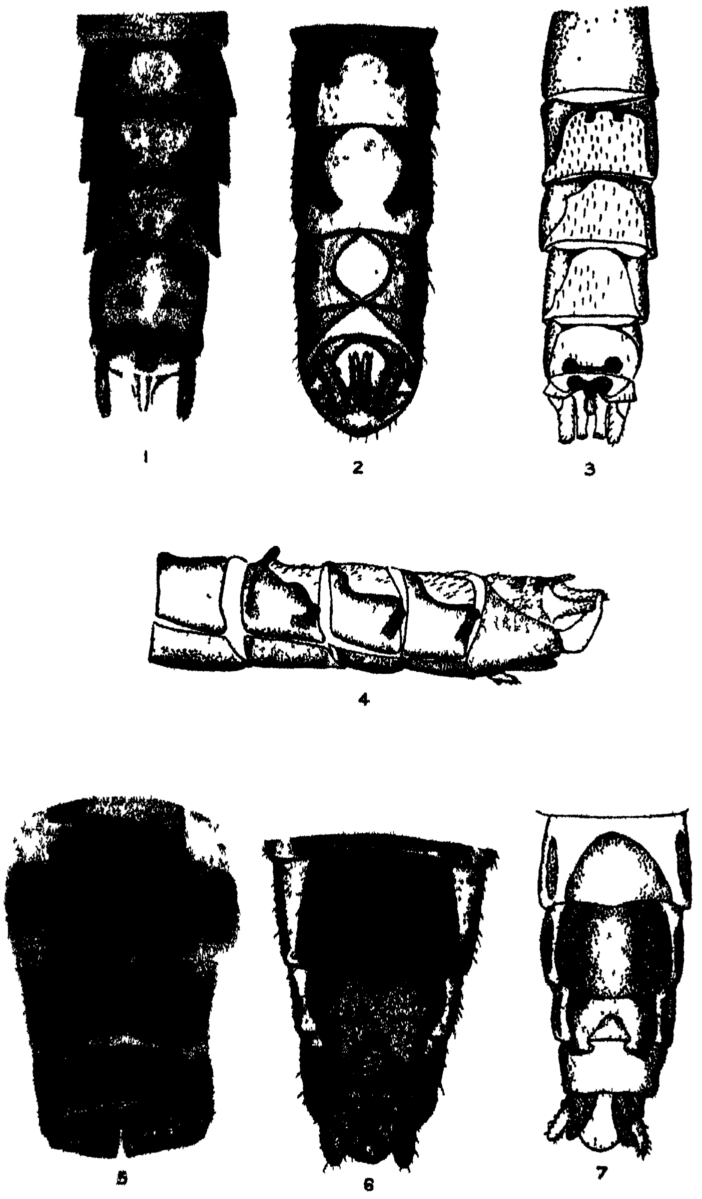

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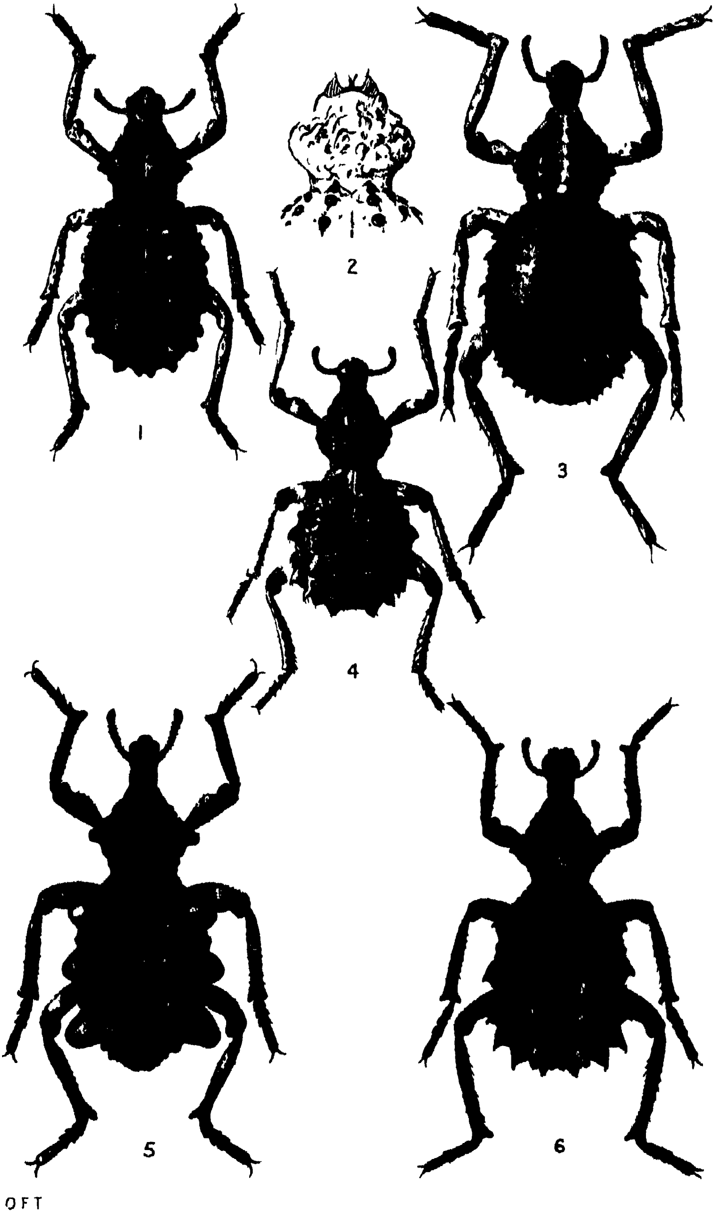

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